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CONSERVATION AS FORMERLY PRACTICED BY THE INDIANS IN THE KLAMATH RIVER REGION

By RUTH KELLETT ROBERTS

THE INDIANS subsisted on the resources which nature provided. Where natural resources were bountiful, the population was most numerous. Streams and areas that abounded in food supplies became, naturally, the permanent abodes of the Indian.

The lower Klamath River region supplied all the necessities of food, shelter, clothing, and materials for utensils, which their

mode of life required. Through its entire length the Klamath River drainage area was supplied with foods in great abundance and variety. The waters of the river teemed with fish and the neighboring forests abounded in deer and other game. A rich supply of acorns was furnished by the oaks; and grass seeds, pine nuts, and berries were easily obtained. The Indian name for the river itself is said to have meant "abundance," and it naturally followed that this locality supported many thriving Indian settlements. The density of the pre-white population of this region was noted and commented upon in the early investigations of Stephen Powers,¹ and in the later studies of A. L. Kroeber.²

During the acorn gathering season, the population migrated to areas where the oak trees were most numerous and frequently established camps there. Similar excursions were made for the purpose of gathering grass seeds, pine nuts, sea weed, berries, and other necessities.



Fig. 65. Trolling at the mouth of the Klamath River.

Regard for property rights among them was very much higher than it is among some of our more civilized people. They were not obliged, upon their return to their established homes, to make an inventory of the depredations committed upon their property during their absence.

An exchange of products among the Klamath River Indians amounted to a commerce which provided all groups with such supplies as they were in need of. Sea weed and other ocean foods were exchanged by the Indians living near the mouth of the river for such necessities as were more plentiful along the upper stretches of the stream.

The Indians, of necessity, avoided diminution of any natural resources upon which their life depended. Public opinion and community law disapproved of any waste. Trees were felled only for

¹ "Tribes of California," Cont. N. Am. Ethnology, vol. III, Washington, 1877, Stephen Powers.

² Bureau of American Ethnology, Bulletin 78, Handbook of The Indians of California, A. L. Kroeber.



Fig. 66. Looking up the Klamath River from Requa. Red Mountain in the distance.

construction of canoes and houses, and dry brush and sticks were used for firewood. Seasonal burning over of certain areas was related to their mode of farming, as it served to produce grass seeds for food, and hazel twigs and grass for basket weaving. This was done every two years. It also protected their game by destroying the underbrush shelters of predatory animals. Systematic burning did much to rid the immediate neighborhood of rattlesnakes, mountain lion and bear, and to check the increase of insect life.

To destroy wild life for any other reason than to meet his need of food would have been as ridiculous a procedure to the Indian as if we entered our own gardens or went among our own herds and destroyed for the sheer enjoyment of our prowess as destroyers.

This "happy hunting ground" of the Indian showed no depletion of its remarkable resources of fish and game until after the advent of the whites.

In contrast to the white man's idea of sportsmanship, the Indian killed only what he needed for food, and he wasted no edible parts of



Fig. 67. Eel traps used on the Klamath River.

the game taken by him. Even the entrails of animals were dried for winter food for the dogs. Any one who caught more fish or killed more game than he and his family could use shared it with others who were less fortunate. To the Indian, hunting was not a sport; it was a means of obtaining his food supply, and the killing of wild life was limited to his necessity for sustenance. To destroy this supply meant nothing short of self-destruction.

The white pioneers of this region killed off great herds of elk and deer for their hides and left the carcasses to be devoured by the buzzards. The modern "sportsman" catches steelhead and salmon for the "sport," and in many cases takes a quantity far greater than he has any use for and leaves them on the shore to rot. Prowess as a killer of wild life is still mistaken by many as an indication of superior sportsmanship. This notion is very largely an inheritance from early days in the West, when wild life was plentiful and when boastful satisfaction was proportionate to the killer's skill in destroying it.

A Yurok legend tells that woman held the hidden knowledge of the source of food supply and guarded this secret jealously. In this respect Indian tradition agrees closely with the belief that prevailed generally among other races at the dawn of history.

The origin of the most important food supplies, such as salmon and acorns, is accounted for by legend. According to the Indians, the Klamath River at one time emptied at the site of the old Indian village of "Omen," at the mouth of Wilson Creek, four or five miles north of the present outlet, but no fish entered there and the Indians were hungry. The Creator, seeing their plight, shifted the river mouth to it's present location, and brought "Oregos" (a tall rock shaped like a woman) from "Omen" to "Rekwoi," the Yurok village at the present mouth, and placed this rock for "luck," and as guardian of the river. Still there were no fish; and so "Oregos," at the suggestion of an Indian boy who had been prompted in a dream, went across the ocean by canoe to another land, and brought back a charmed fishing rock. This was divided by "Oregos" into two sister rocks, with identical names. One was placed at the base of "Oregos" on the north side of the river, and the other near the foot of the hills on the opposite side of the stream, marking the limits within which the river at various times shifts it's outlet. After the placing of these rocks, fish came into the stream, and the annual runs have continued ever since.

The food supply was regarded as the gift of the Creator, and the taking of fish was a solemn and prayerful undertaking, governed by very strict formulae. The first salmon to enter the Klamath in the spring was permitted, with elaborate ceremony, to pass up the river, as the Indians believed this fish acted as a leader for the run to follow. It was thought that this salmon in its ascent to the spawning grounds left scales on the rocks to indicate the route which the salmon entering later should follow, so that the Indians up river would be assured of a food supply. Other leaders, and then the whole run of salmon, followed, leaving their scales; and by the time they reached the spawning grounds they were battered and exhausted.

One of the earliest, if not the earliest, observations to be made of the condition of the salmon in the spawning stream, is that recorded

in the diary of the overland party of the Wilkes' Exploring Expedition, early in October, 1841. According to this record these explorers purchased two salmon which the Indians had taken from the Shasta River. Their description of the fish is: "The salmon were of a whitish color, and not at all delicate to the taste; their tails were worn off, and the fish otherwise bruised and injured."

References are made in Indian lore to seasons when there was a limited run of fish. One tale, antedating the coming of the white man, tells of a war between the Tolowa Indians of Smith River and the Karok Indians of the Klamath, brought on as a result of the fact that the fish, in this particular year, had entered the Klamath, but not the Smith River. The Tolowas blamed the Karoks for this calamity. About 1200 warriors from Smith River crossed over by the trail that later became known as the Kelsey trail, and descended upon the village at what is now Happy Camp, burned the houses, killed as many of the inhabitants as they could, took the Karok food supplies and canoes, and started down the river. News of this attack reached the Indians down stream, who closed in upon the marauders in the gorge at Ishipishi Falls, and killed all but three of them.

Another legend tells of a great famine that spread among the Indians along the entire lower stretches of the Klamath River, when no fish or eels came in. Other food sources had also failed. Even the mussels were blasted, and there were no acorns. In the belief that three sisters who resided at the Yurok village of "Rekwoi" had secret knowledge with which they had prevented the entrance of the fish, the Karoks and Hoopas descended upon the village before the inhabitants were awake, and set fire to the houses. Many Yuroks, both men and women, were killed, and a great war involving the whole region from Smith River to Orleans and Hoopa resulted.

The food supply sources were not in all cases common property. Many of the acorn producing groves and grass seed and brodea patches were owned by individuals and by family groups. Since salmon was an important part of the food supply of the Indians on the river, individual and family ownership of fishing places developed and was scrupulously respected. A single fishing place was sometimes held in joint ownership by several individuals or families. The women and girls did not fish, but assumed responsibility for smoking and drying the catch. Persons who did not own a fishing place, or who were not allowed dipping privileges by the owners of such places, were given fish in payment for assistance rendered to those who had such rights.

Ownership of these fishing places could be transferred by will for care in old age or during illness, and could be sold. Ownership was sometimes staked in gambling and lost, and was sometimes given in advance payment to an Indian doctor. Good doctors became very rich, both in possession of fishing places and in Indian money and flints. Among some Indian groups there was a law against a doctor exacting a mortgage on a fishing place, or acquiring a fishing place in advance payment for "doctoring."

Besides the individual ownership of fishing places, there were community projects, such as at the mouth of the Salmon, in the pools below Ishipishi Falls, and the fish weirs at "Lo-olego" (an Indian village just above Weitchpec, now extinct) and at Kepel. Jedediah S. Smith's

party of American trappers recorded the presence of a "fishing establishment" in the vicinity of Weitchpec, in May 1828, which was probably the one at "Lo-olego."¹

Frequent mention is made throughout Smith's diary of the volume of water observed in all of the streams of this area, which would indicate that in 1828 a very much larger flow existed than at present.

A fish weir was put in at Kepel in September, and was allowed to remain until carried away by high water, about a month later. The weir consisted of a series of traps extending across the river with a space at either end, near the banks, wide enough to allow canoes to pass. This space also permitted the passage of fish. Many fish jumped over the weir, which projected about three feet above the surface of the river, and made their way up stream.

The several important families who sponsored the construction of the weir had prior dipping rights. They took what fish they wished each morning, and were followed by those who possessed no fishing places or privileges.²

At the height of the run, when there was danger of the dam being broken by the crowding of fish against it, the traps were opened after the day's fishing, and the fish allowed to pass through until the next morning. Indians in great numbers from a considerable distance up and down the river gathered here for the annual fishing event and for the merrymaking that accompanied it.

At the mouth of the Salmon, and in the pools below Ishipishi Falls, quantities of salmon were taken in dip nets. In the fall, Indians came here from great distances to fish. It has been reported that the salmon were so numerous that thirty or forty were taken at one time in a net, and that several men were required to drag the catch to shore.

Another instance of the recognition of established community rights with respect to a food source is mentioned by Kroeber.³ This was in the case of whales that were occasionally washed up along the Humboldt and Del Norte coast. The tribal boundaries determined the group ownership of the whale carcass. Each man took a cut a half fathom wide, and the rich man, a full fathom.

In describing methods of fishing, Kroeber states:⁴

"The dip net, or lifting net, as it may be called to distinguish it from a smaller instrument on an oval frame occasionally used by the Karok and other tribes to scoop boiling riffles and rapids (Pl. 6), was let down from a scaffolding built out over the water, almost invariably at some eddy or backwater. Here the fisherman sat on a block or little stool, holding the bone button of the string which closed the entrance to the pyramidal net stretched out in the current. This net was hung from the bottom of a long A-shaped frame with a bottom crossbar. The whole was hauled out as soon as a pull on the cord had inclosed a salmon, which was then struck on the head with a club. A single night's vigil sometimes produced a hundred salmon, it is stated—a winter's supply, as the Yurok say. At other times a man will sit for half a day without a stir. The old men are much inclined to this pursuit, which would be trying to our restless patience, but gives them

¹ Dale, *The Ashley-Smith Explorations*.

² Originally the weir was equipped with eight traps, but with the decrease of Indian population the number of traps diminished to four.

³ Kroeber, *op. cit.*, p. 14.

⁴ Kroeber, *op. cit.*, p. 85-86.

opportunity for undisturbed meditation or dreaming or mental idleness along with a sense of profitable occupation. (Pls. 4, 7.)

"Lampreys, customarily known as eels, much prized by the Yurok for their rich greasiness, also ascend the river in great numbers, and sturgeon are not rare. Both species are taken much like the salmon, though of course with a net of different mesh. In the lower river eel-pots were also set. Trout in the affluent creeks are too small to be much considered by a people frequently netting 20-pound salmon.

"Both salmon and lampreys were split for drying—the former with a wooden-handled knife (Pl. 16) of 'whale-colored' flint, as the Yurok called it; the latter with a bone awl. A steel knife probably involves a different and perhaps a more precise handling, so that until a few years ago the old women clung to the aboriginal tools. Most of the fish was somewhat smoked and put away in old baskets as strips or slabs. The pulverized form convenient for packing, known also on the Columbia, was probably more prevalent among interior and less settled tribes like the Shasta. Surf fish were often only sun dried whole and kept hung from poles in rows. They make a palatable food in this condition. Dried salmon is very hard and nearly tasteless, but rather satisfying and, of course, highly nourishing.

"A long net was sometimes set for sturgeon. One that was measured had a 6-inch mesh, a width of 3 feet, and a length of 85 feet, but in use was doubled to half the length and double the width.

"A measured salmon seine had a scant 3-inch mesh, a width of $3\frac{1}{2}$ feet, and a length of over 60 feet.

"Nets were made of a splendid two-ply cordage rolled without tools from fibers of the *Iris macrosiphon* leaf. The gathering of the leaves and extraction of two fine silky fibers from each by means of an artificial thumb-nail of mussel shell was the work of women. The string was usually twisted and the nets always knotted by men. The mesh spacer and netting shuttles were of elk antler; net weights were grooved, pierced, or naturally perforated stones. (Fig. 7.)

"The salmon harpoon, which could be more frequently used in the aboriginal period than now when mining renders the river opaque, had a slender shaft, sometimes more than 20 feet long. To this were attached two slightly diverging fore-shafts, one a few inches the longer, on which were set the loose barbs of pitched and wrapped bone or horn. The lines were short and fastened to the main shaft, a pay line being unnecessary for prey of the size of a salmon. In fact, an untogged barbed spear would have sufficed but for the opportunity its resistance offers a heavy fish to tear itself free. This harpoon was made with no essential variation in practically all fishable parts of California, and it is the only harpoon known, except for a heavier implement driven by the Yurok and Chumash into sea lions."

In small streams fish dams were made of green poles with a fill of brush and rocks, but always with one end of the barrier free from the shore, which permitted the passage of fish.

Trout were caught in a V-shaped set basket which looked like a dip net. Set baskets were also used for trapping eels. These were set in the river and emptied at intervals.

The Indian fished practically throughout the entire year. No limit to the catch was imposed other than that determined by the needs of

the person or family fishing. Fishing rights were determined by ownership (or lack of ownership) of a fishing place, possession of extended fishing privileges, or accessibility to a common fishing place.

Salmon were permitted to pass up the river for a half moon before any were caught. Most of the spring salmon were allowed to pass, except what was wanted for immediate use. This run was so rich in oil that the fish did not keep when smoked. The summer and fall salmon were preferred for drying. This may have been because they contained less oil and particularly for the reason that by taking the later run the winter food supply need not be carried through the warm summer.

Open deer season was fixed at a time in the fall when wild celery seeds were ripe. Deer and elk were trapped in pits or snares, or were taken with the aid of dogs. If bucks could be found, does were not killed. Each family killed as many as it could use. All surplus meat was jerked for winter use. Quail and grouse were not taken during the nesting period unless a family was starving. There were no restrictions upon the taking of eels.

It was an established belief among the Indians of the lower Klamath River region that any person who violated accepted fish and game regulations would "loose his luck" as a hunter or fisherman, or would not live to hunt or fish another season. This belief had a very restraining effect. The conservation of fish and game on the Klamath River, as elsewhere, is very largely a struggle to restrain the white man in his delight in killing.

THE LIFE-HISTORY AND THE CONTROL OF THE CROPWORM, *CAPILLARIA CONTORTA*, IN QUAIL

By ADELE HOBMAIER

TWO IMPORTANT species of cropworm in quail belonging to the genus *Capillaria* are known, namely *Capillaria contorta* and *C. annulata*. In the eighteen cases of the past year in which the presence of cropworm has been observed in the State Fish and Game Laboratory, *Capillaria contorta* exclusively could be collected. Only in one case a ring-neck pheasant (*Phaseanus colchicus torquatus*) was the host, meanwhile quail were found to be infested in the remaining seventeen cases. Fifteen of these parasitized quail were raised by breeders, and two wild living ones. This observation may justify the statement, that *C. contorta* is the ordinary cropworm of quail in California and that the importance of this parasite is more significant in game farms than in free living quails.

The life-history and the control of *Capillaria annulata* is closely related to that of *C. contorta*. Having ascertained, however, *C. annulata* as yet in no case, the description is confined here to that of *Capillaria contorta*.

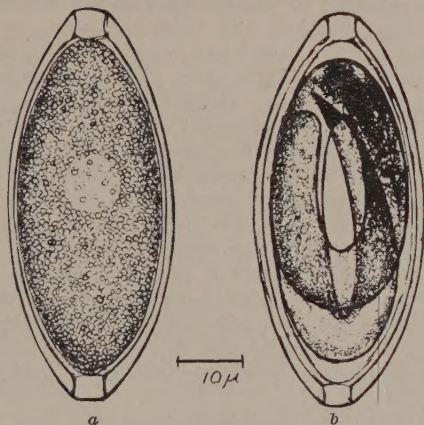


Fig. 68. Eggs of *C. contorta* (size about 1/416 inch). *a*. Immature egg. *b*. Egg containing an active embryo.

Its control is of importance. Besides the fact, that health of the birds may become weakened and even death may occur, there remains the possibility of spreading the infestation to localities hitherto free from this parasitic disease. Thousands of quail are raised every year throughout California to be liberated later. It is imperative that these birds are free from any bacterial or parasitic disease.

Reference is made to the valuable work done by other investigators especially by Cram, who has contributed much towards our knowledge on this subject. It may be recalled that Dr. Henry Van Roekel previously has published two pictures of the parasite in the CALIFORNIA FISH AND GAME, Vol. 15, No. 4, showing the adult roundworms and a part of an egg-bearing female.

LIFE HISTORY

The life cycle of parasites is different in some way by every genus. The prevention of infestations and even often their control depends on the knowledge of their life history. There are two principal forms of development of parasites: A direct one completed without using an intermediate host and an indirect one, which requires the presence of an intermediate host.

The cropworm of quail belongs to the group of parasites without intermediate host. Every adult female cropworm living in the mucous membrane of the crop produces thousands of eggs. These eggs pass out together with the droppings, the eggs, however, if swallowed by other birds are as yet unable to produce an infestation because of the immature stage of the eggs. They are as yet not embryonated (Fig. 68a). Even under suitable conditions about five weeks are required to produce an embryo (Fig. 68b). Those eggs containing an active embryo are infestive. Oxygen, a certain amount of moisture, and a temperature not far below 60° F. are necessary for this development. The absence of one or more of these conditions produces a retardation in the development and finally death of the eggs. Even when kept in

cultures the time required for the embryonisation was different. Meanwhile the first eggs reached the infestive stage in 4 weeks, the greater part ripened after about 5 to 6 weeks. Others showed advanced segmentation 9 to 10 weeks later, and a certain amount of eggs had died under the same conditions. Complete dryness lasting longer than three days was able in my experimental work to kill the eggs in development as well as the eggs with a developed embryo. The observations of E. Cram, however, show that cultures with embryonated eggs remained infective for about 11 months if alternately dry and wet.

That behavior is able to throw some light on the epidemiology of the disease. Wild living birds are less infested because the eggs are spread over a larger area, meanwhile the possibility to become infested is a very great one in the small pens of home raised birds. This development shows on the other hand, that the infestation is dependent to a large extent from climatic and hygienic conditions of the pens. That will be remembered hereafter discussing the control of the disease.

The infestation of the quail is accomplished in a simple manner. The embryonated eggs are swallowed with the food. The microscopical eggs from the size of about $60\ \mu$ in length are lemon shaped and closed on both ends by a mucous plug. (Fig. 68.) These plugs become dissolved in the crop and the larvae leave the eggs and penetrate the mucous membrane of the crop.

About 5 weeks later adult females and males can be found and ovoposition takes place. The adult worms are embedded in the mucous membrane. Both are threadlike worms. The full grown female is about 6 cm ($2\frac{1}{2}$ inches) long, the male about 3, 6 cm ($1\frac{1}{2}$ inches). Both show a white color. The ovoposition, however, has been observed by females already 3, 5 cm long. The adult worms disappear in the course of at least one year after infestation.

OTHER HOSTS

From the standpoint of the control it is noteworthy, that the parasite is not exclusively found in quails but also in different other birds. It is noted by different species of pheasants (*Phasianus colchicus*, *Ph.*

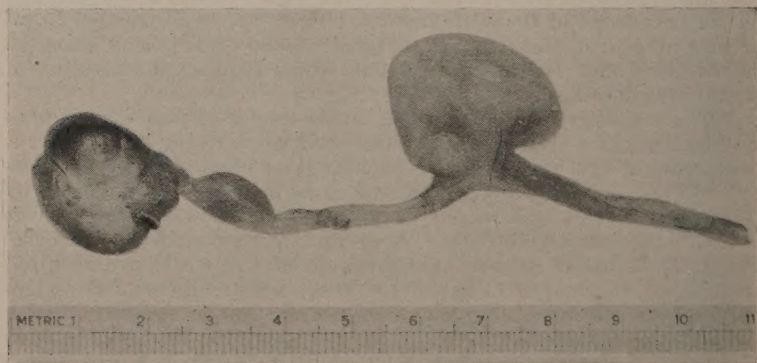


Fig. 69. Esophagus, crop and gizzard of a heavily infested California valley quail.



Fig. 70. *a.* Epithel of the surface of the mucous membrane showing destruction and emaciation. *b.* Papillae of the mucous membrane. *c.* Muscular tissue of the crop. *d.* Sections through parasites living in tunnels near the papillae. *e.* Sections through a female parasite. Uteri filled with eggs and eggs around the worm. *f.* Accumulations of eggs in tunnels of the epithelium. *g.* Scattered eggs on the surface of the mucous membrane.

colchicus torquatus), by domesticated and by wild ducks and by different other wild birds which are of less importance.

Chickens could be infested in the Fish and Game Laboratory by feeding with embryonated eggs of *Capillaria contorta* collected from a California valley quail, meanwhile earlier investigators were not able to produce an infestation of these birds using a strain collected from a ring-necked pheasant.

No differences could be observed in the development of *Capillaria* in quail and in chicken. Eggs of the parasite appeared in chicken about six weeks after infestation like in quail. One month later the birds have been killed without showing symptoms of disease. Post-mortem examinations revealed an inflammation of the mucous membrane of the crop and the presence of dozens of roundworms. Only about the twentieth part, however, of the parasites fed previously to the chickens had developed into adults.

Apparently this is the first record of an experimental infestation of chickens due to a strain obtained from quail. Infestations of chickens under natural conditions, however, are reported. In the Fish and Game Laboratory the parasite has been found besides in the California valley quail and in the bobwhite quail in a ring-neck pheasant,

in accord with observations of other investigators. Working on duck disease (Boutillism) a large number of different species of wild ducks carefully has been investigated, but no crop worms of the species *Capillaria canalis* could be as yet detected. The parasite, however, has repeatedly been observed in pintail (*Dafila acuta*) by other investigators.

PATHOLOGICAL CHANGES

Slight infestations with the roundworm ordinarily remain undetected during the life of the bird. A microscopical investigation of the droppings would be required to detect the eggs of the parasites. Even a detailed post-mortem examination would show no peculiar microscopical changes besides a slight inflammation of the wall of the crop and the presence of the roundworms. These unrevealed carriers, however, later on may be detrimental to the entire flock spreading the disease under more suitable conditions.

Heavy infestations are followed by general and local disturbances of the bird. Emaciation and weakness ordinarily are well marked. The crop shows particular changes. (Fig. 69.) Its wall appears to be enlarged, thick, stiff, and reddish. The crop mostly bears no food. Its content consists of a copious creamy white-yellow fluid. A microscopical investigation reveals that it consists of desquamated epithels, mucous, and a large quantity of eggs. The subjacent epithel layers of the mucous membrane are soft, cheese-like, and thickly folded. The spying glass reveals the presence of a great number of roundworms lying in snake-like curvings under the epithels, especially near the borderline of the muscular tissue in the papillarzone. The wall of the epithelium appears about twice to three times thicker as ordinarily, meanwhile the muscular tissue of the crop is not evidently damaged. Similar changes may be present in severe cases in the mucous membrane of the undilated esophagus, especially near the crop. Microscopical slides are required to reveal the finer changes of the diseased tissue. The wall of the crop as a part of the esophagus consists of two plates of tissues of a mucous membrane inside and of a muscular tissue outside, both are fixed together by connective tissue. The mucous membrane is steadily peeled off on the surface to be renewed by the germinative cells of the papillae. The upper layers of epithels are mortified and hardened by a natural horning process.

The histological slide above (Fig. 70) presents the picture of a heavily infested crop. Different sections of roundworms may be seen. (d, e.) All are situated near the papillae in the strata of the germinative cells. They have formed tunnels in this region of the mucous membrane. Some of these tunnels partially are filled with eggs (e). The large amount of eggs produced by a single female worm may be seen on the section of the uteri of worm (e). The layers of the mortified epithels are enlarged, and partially liquified (a). Accumulation of eggs are visible on different places of the mucous membrane (f). Eggs are scattered on the surface and near the surface of the mucous membrane (g). The irregular shape of the surface and the destruction of these cell-layers is of interest. Besides the fluid exudate only a few round cells are to be seen in the papillae and near the tunnels. The muscular tissue (c) of the crop shows no changes.

With this picture at hand the life cycle of the parasite inside the body of the host can easily be interpreted. The roundworms are living on the germinative cells of the mucous membrane. We do not know if they feed on these cells or if they consume the tissue lymph. We believe the latter. In undermining this region they form tunnels and in doing so they cause a destruction of the most important part of the mucous membrane. This process is followed by an irregular harning process of the mortified epithel layers and by a transudation of tissue lymph into the epithel. Both changes produce an irritation of the mucous membrane, marked by a creamy fluid mentioned above.

The ovoposition takes place inside the tunnels (e.). These burrows continually are brought nearer to the surface of the mucous membrane by its natural growing process (f.). Finally the eggs are scattered on the surface (g.). Now they have the possibility to pass out with the droppings. In this way the life cycle of the parasite is completed and may originate again.

SIGNIFICANCE

Slight infestations with the cropworm produce no marked symptoms of disease in quail as pointed out previously. These cases ordinarily remain undetected. The danger of a serious outbreak of cropworm-disease, however, is to be feared, especially during the rainy season of the year.

Heavy infestations may produce weakness of the birds, emaciation, and even death. Most of the investigators believe the deadly action of the cropworm may be an indirect one, preparing the tissue for the entrance of different germs. Other theories advanced to disclose the death of the birds assume an obstruction of the esophagus, a mechanical inertia of the wall of the crop, and an asphyxia produced by pressure on the pneumogastric nerve.

After my investigations, I believe the death of infested quail is caused by a disturbance of the digestion followed by a chronic starvation. Post-mortem examinations reveal in these cases an empty digestive tube and an extreme loss of body weight besides the changes above described in the wall of the crop. If on the other hand infested birds are found dead being in good flesh the death may be caused by another unknown disease. The presence of cropworms may be inconsideable or having favored the entrance of deadly germs.

CONCLUSION

The principal facts in the life history of *Capillaria contorta* are the following:

1. The infestation of quail with the parasite lasts about one year, if death does not occur.
2. During this time thousands of eggs are deposited with the droppings, contaminating the soil.
3. Under suitable conditions the eggs become infestive about 5 weeks after their deposition.
4. Lack of oxygen, freezing temperature, and dryness may delay the development of the eggs and finally destroy them.
5. An infested pen remains infestive practically throughout the year.

6. Slightly infested birds show no symptoms of disease. They are carriers and therefore responsible for new outbreaks. Heavily infested birds succumb to the infestation.

CONTROL

From the development of the parasite we have learned that there are stages of the roundworm inside the body of the host and that others exist outside the host. Therefore two possibilities exist to control the parasite; namely to destroy the eggs outside the body, or to kill off the mature forms of the worms inside the host.

If we intend to kill the adult worms the use of certain drugs is required. Carbon tetrachloride has been recommended. It is the best of the parasiticide drugs, but unfortunately highly dangerous by improper administration. It would be preferable to use a milder drug, for instance a solution of 2 per cent carbolic acid or a solution of 1 per cent copper sulfate (bluestone), added to the drinking water or to the mash.

The second way and a more preferable procedure to control the disease would be to interrupt the development of the eggs outside the body. Remember that the ripening process of the eggs requires about 5 weeks. The use of any disinfectants is not required if we remove the eggs prior to that time. The worms have no possibility to become developed, if the pens are properly handled according to hygienic requirements. That includes to remove one to two inches of the dirt surface of the pens every second week and to replace fresh sand. This time would be sufficient to prevent the cropworm development. To perform that procedure without molesting the birds and in order to do it with accuracy the use of a double set of pens is commendable. Avoid wet places in the pens. Wet places are favoring the outbreak of different diseases. Use a wire-mesh square about 1 yard large and about two or three inches high to put the water container at top. Quails may be kept strictly separated from any other birds, especially from chickens and turkeys.

Take the opportunity to send birds at the beginning of a disease to the laboratory for investigation and do not delay until the disease has spread over the entire flock.

THE STRIPED BASS SUPPLY, PAST AND PRESENT¹

By G. H. CLARK

IN LINE with the policies of the Division of Fish and Game to ascertain the condition of our fisheries from year to year, the striped bass catch in the San Francisco Bay and adjacent river regions has been analyzed² for the years 1928–August 14, 1931, inclusive.³ This continued the work of Craig.⁴

The results of this study are of importance to everyone—sportsmen, commercial fishermen, dealers and laymen of the State.

Craig (1930) demonstrated that the total catch of striped bass did not give a correct index of the availability of this species to the fishermen. For this reason in the present as well as in Craig's report, individual boat catches were used to determine the yield per effort expended.

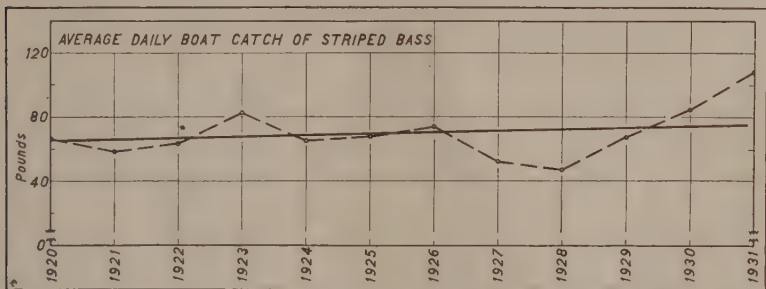


Fig. 71. Average daily boat catch of striped bass in pounds calculated for the years 1920–August 14, 1931.

The source of material used—the boat catches of the commercial netters—and the methods of analysis were the same as employed by Craig (1930).

The result of these methods is the catch per fishing unit and time expended—it is a trustworthy measure of the availability of striped bass to the fishermen.

Figure 71 shows that the striped bass boat catch was fairly constant from 1920 to 1927, inclusive. In 1928 the catch dropped slightly, only to recover in 1929 and 1930 and to reach a new high point in 1931.

¹ Contribution No. 126 from the California State Fisheries Laboratory, August, 1932.

² This article is a brief summary of the detailed report on the statistical analysis of striped bass catches from 1928–August 14, 1931, which is in manuscript form awaiting publication.

³ The analysis was carried on with data from the commercial net catches to August 14, 1931, only, because on that date it became unlawful to take striped bass by means of nets at any time except when taken accidentally in shad nets in District 12B between March 15–April 30, inclusive. It is not illegal however to take bass for the market by hook and line.

⁴ Craig, J. A. An analysis of the catch statistics of striped bass (*Morone saxatilis*) fishery of California. Calif. Div. Fish and Game, Fish Bull., no. 24, 1930.

Without doubt the striped bass were extremely plentiful in 1929-1931. Aside from the biometric study here presented, the fishermen (both sportsmen and commercial) can testify that striped bass were abundant and that catches were larger and easier to make in these years. The commercial dealers found fish so plentiful that it was necessary to place limits on the boats for the first time in the history of this fishery. These limits were set in the fall of 1929 and during parts of the seasons of 1930 and 1931, in order not to flood the over-supplied markets and to prevent any further decreasing of the abnormally low striped bass prices.

The fact that commercial fishing methods and gear have not changed to any extent in the last few years and that the unit of effort has remained constant, indicates that the increased boat catch was due to an increased abundance of bass. The numbers of bass taken by anglers¹ undoubtedly have increased each year, for this sport has become very popular with anglers, drawing more and more sportsmen to striped bass fishing. In spite of this increased drain on the striped bass population, this species increased in 1931 to a point higher than in any previous year analyzed in our study. (See Fig. 71.)

It is difficult to point to any one factor or factors and say this or that is responsible for the increase of the striped bass abundance. Very likely, however, the early legal protection given this species as well as the later additional wise conservation restrictions of fishing areas and sizes of fish are responsible for a great part of the gain in the population. This protection, of course, was both direct, through the limitation of the total catch, and indirect, through the protection of sizes of fish and restriction of waters, so that successful spawnings of striped bass occurred year after year. The last striped bass law passed in 1931 is not considered a conservation measure, as it throws open all previously closed fishing areas to commercial and sport hook and line fishing and gives no protection to large spawning bass.

From the results of this study and of this investigation, it appears, if conditions remain the same, that there are enough striped bass for everyone. However, intelligent conservation of this species should be continued. The restrictive measures previous to 1931 did not seriously hamper the fishermen, both commercial and sport, and assured a steady yield to all concerned without depleting the breeding stock.

SECOND ANNUAL BLACK BRANT CENSUS IN CALIFORNIA

By JAMES MOFFITT

THE RESULT of the first annual census of the black brant (*Branta bernicla nigricans*), undertaken by the California State Division of Fish and Game and voluntary cooperators February 6 to 12, 1931, was announced by the writer in CALIFORNIA FISH AND GAME, Vol.

¹For catch analysis in future years, it would be very advantageous to have a record of the catches made by anglers together with the effort expended. At the present time we have no record of the number of striped bass anglers or statistics of their catch.

17, No. 4, pp. 396-401. In this paper, I pointed out the fact that on account of the concentration of this bird on a few of our larger coastal bays supporting growths of eel grass (*Zostera maritima*), it is possible to secure rather accurate censuses of its numbers within our State. This condition is practically unique in brant among waterfowl, most of the rest of the species in this group being so widely distributed over the State as to render any effort at census taking both extremely costly and inaccurate. Because our winter population of black brant could be counted so easily and at a nominal expense each year, it was thought highly desirable to take annual inventories, so to speak, of this important game bird. Thus, if similar records are taken each year at the same time and places and preferably by the same observers, we will soon have a very good indication of the status of the bird. Naturally these records will increase in value as the result of each additional year's count is obtained, which fact in itself proves the necessity of continuing this work regularly each season.

In 1931, the period February 10 to 12, inclusive, was chosen for census taking as we considered the maximum number of birds would then be present on our waters. It now appears that this date is somewhat early for this condition to exist, particularly after a heavy winter as was our last one, for the birds seemed to be rather late in reaching our waters in 1932 and maximum concentration probably did not occur before March 1 this year. However, the fact that the first census was taken on these dates outweighed this condition so we planned to take our 1932 counts on the same days.

More time for organization of the work in 1932 resulted in counts being made at all important points this year. Thus censuses were taken in 1932 on Bodega and Drakes bays, which had to be omitted in 1931 because cooperators could not be organized to take them. The results in 1932 show the importance of including these waters. This was possible through the kind cooperation of Mr. T. T. McCabe and Dr. Jean Linsdale of the Museum of Vertebrate Zoology, Berkeley, who volunteered their services to take censuses on the respective bays, and to Dr. Joseph Grinnell, Director of the Museum, for permitting Dr. Linsdale to do this work. Acknowledgment of similar cooperation is also due Mr. L. M. Huey and Dr. Clinton G. Abbott of the San Diego Natural History Museum for observations made at San Diego and Mission bays, and to Mr. C. I. Clay, and Captain of Patrol William Harp of the Division for assistance rendered at Humboldt Bay.

The results of the various counts in 1932 follow, and for comparison, the figures for 1931 are also provided where censuses were made in that year.

Locality	Date	Observers	Number of birds counted	
			1932	1931
Humboldt Bay	Feb. 12, 1932	C. I. Clay, Wm. Harp James Moffitt	29,415	500,000 (?)
Bodega Bay	Feb. 11, 1932	Jean Linsdale	3,200	No count
Tomales Bay	Feb. 11, 1932	James Moffitt	6,285	9,445
Drakes Bay	Feb. 11, 1932	T. T. McCabe	2,108	No count
Morro Bay	Feb. 10, 1932	James Moffitt	2,938	4,493
Mission Bay	Feb. 12, 1932	L. M. Huey	None	71
San Diego Bay	Feb. 12, 1932	L. M. Huey	None	None

The count secured on Humboldt Bay this year is thought to be at least 85 per cent accurate which fact is most gratifying after the great

discrepancy that existed between two observers' figures in 1931. At that time, C. I. Clay attempted to count the tremendous concentration of birds on South Humboldt Bay from the shore, which is quite impractical, and there is little wonder that the figures he gave evidently highly exaggerated the number of birds then present. When viewed from a distance, a strip of birds three or four miles long and one or two hundred yards wide, as the brant are wont to consort on Humboldt Bay, gives the observer the impression of "millions" of individuals. Indeed, some residents of Fields Landing, hunters at that, seriously assured us on the day we took the census this year, that there were "millions" of brant present. However, a very careful count failed to record more than 24,415 birds. This shows the difference between estimating and counting.

Messrs. Clay, Harp and I left Fields Landing in an outboard motor boat at ten o'clock in the morning, February 12, 1932. The tide was low (1.5 ft.) at 10.08 a.m. and all the brant in the vicinity were apparently feeding in the bay at this time. A brisk northwest wind made the ocean outside quite rough, which fact furthered our supposition that most, if not all, the brant were in the bay. Most of the birds were strung out along the shore in an almost unbroken line from a point a little south of the entrance to the southern end of the bay at Table Bluff, thence eastward to Hookton Slough and north halfway to Fields Landing. (See Fig. 72.) This condition made for rather accurate counting, for with Captain Harp running the boat and Clay and I counting independently, we circled the bay in this direction, counting only those birds that flew back of us or to the center of the bay, which all had done by the time the circle was completed on our return to Fields Landing. At the conclusion of the count, 2.00 p.m., a check-up between Clay's and my figures revealed almost identical results. We then drove to North Humboldt Bay by automobile and scanned its waters for brant with glasses from the road. No brant

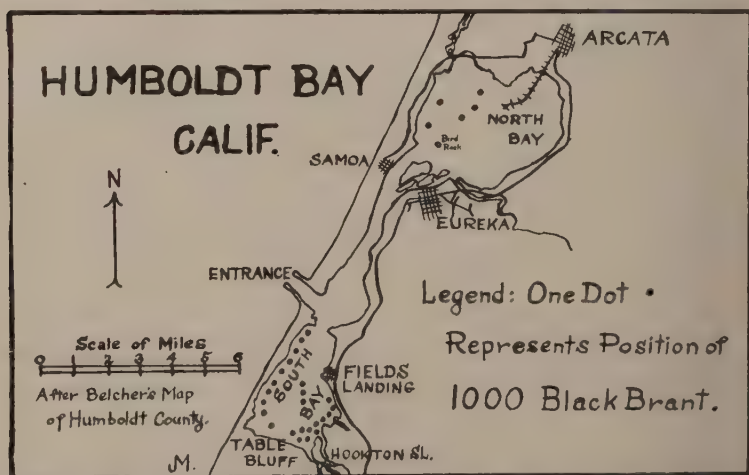


Fig. 72. Map of Humboldt Bay, California, showing position of black brant on its waters, February 12, 1932.

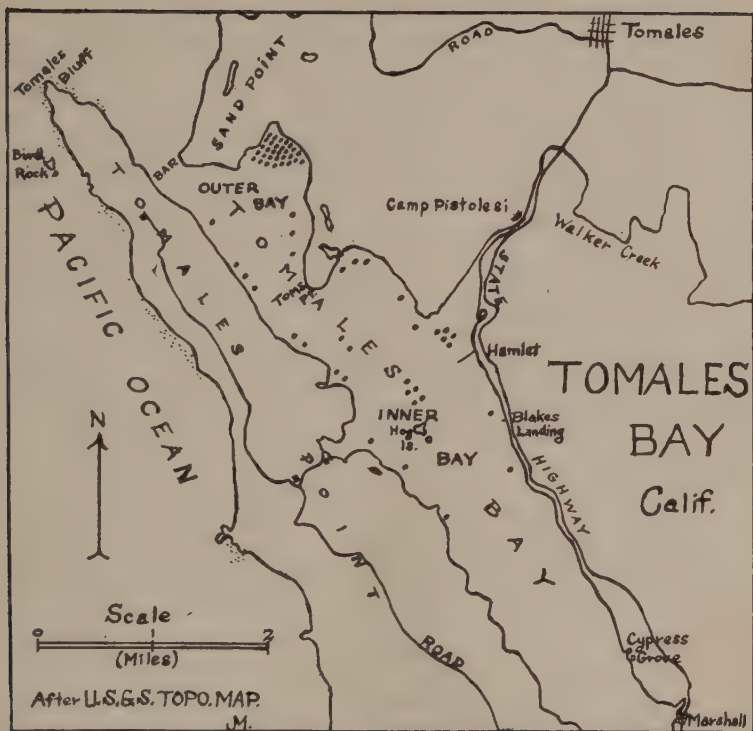


Fig. 73. Tomales Bay, Marin County, California, showing location of flocks of brant at mid-day, February 11, 1932. Each dot represents the position of 100 brant.

was seen between Eureka and Arcata where the water was quite rough from the then strong northwest wind. A considerable number of brant was seen between Arcata and Samoa, mainly lying far off shore where they were difficult to count exactly. We estimated their number to the best of our ability after watching them through glasses and 5000 birds was the unanimous conclusion we arrived at. It is regrettable that time did not permit our also counting the brant on North Humboldt Bay from a motor boat. This census was made between 3.00 and 4.30 p.m. High water (4.3 ft.) was at 3.58 p.m. and as is their custom the birds had fed on the incoming tide and were resting and loafing when we took the census, which accounted for their scattered position far from shore.

I made inquiry among hunters and others while in Eureka February 12 as to the relative abundance of brant on Humboldt Bay this year against a year ago. Numerous hunters, Captain Harp and other members of the Division's patrol force were in agreement that more birds were present in 1931, but all thought that their numbers then were not more than 25 per cent greater than at the same season this year.

Dr. Linsdale took the census on Bodega Bay, February 11, 1932. He counted from the shore with the aid of a telescope between 11 a.m. and 2 p.m. and at the conclusion of his work felt quite certain that he had secured an accurate record of the number of brant on the bay, 3200 birds.

I took the census on Tomales Bay from an outboard motor boat the same day, commencing at noon and finishing at 3.15 p.m. The day was cloudless and calm until one o'clock, up to which time a very accurate count was obtained. A stiff north wind sprang up about that hour which rendered counting more difficult thereafter. The tide was low (1.7 ft.) at 8.41 a.m. and high (4.0 ft.) at 2.51 p.m. The accompanying sketch map (Fig. 73) shows the distribution of the birds on the bay that day. I believe most, if not all, the brant in the vicinity were in the bay as I saw no flocks flying back and forth to the ocean across the bar. It is singular that although Tomales Bay extends south-eastward about 7 miles from Marshall, I have never in some 40 to 50 trips to the bay seen a brant south of a point a half-mile north of this town. At first, I attributed this condition to the fact that their main food, eel grass, did not grow south of this point; but I now understand that it does, so I am at a loss to explain this matter.

Mr. T. T. McCabe counted the brant on Drakes Bay, February 11, 1932, working from the shore with glasses. He comments on his work as follows: "I caught the six o'clock ferry and in the course of a long day covered all of the west and practically all the east side including

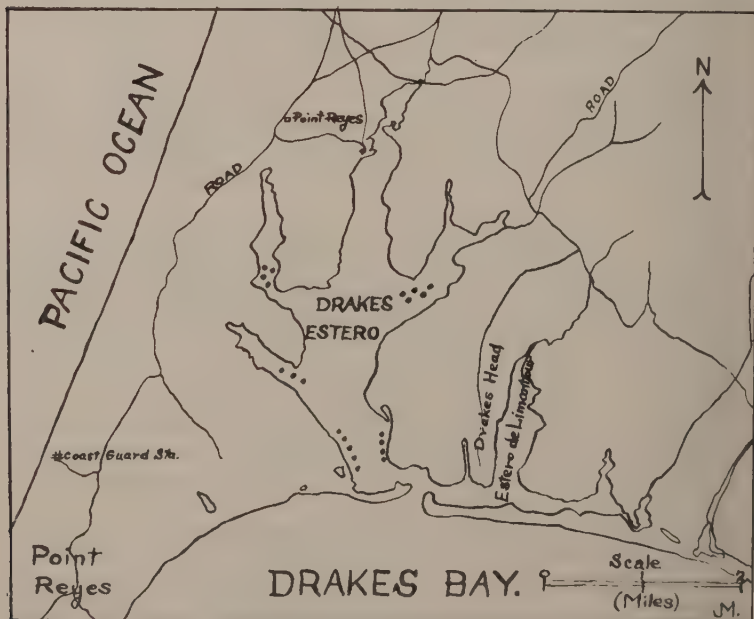


Fig. 74. Drakes Bay, Marin County, California (after U. S. G. S. Topo. Map), showing position of black brant, February 11, 1932. Each dot represents 100 birds.

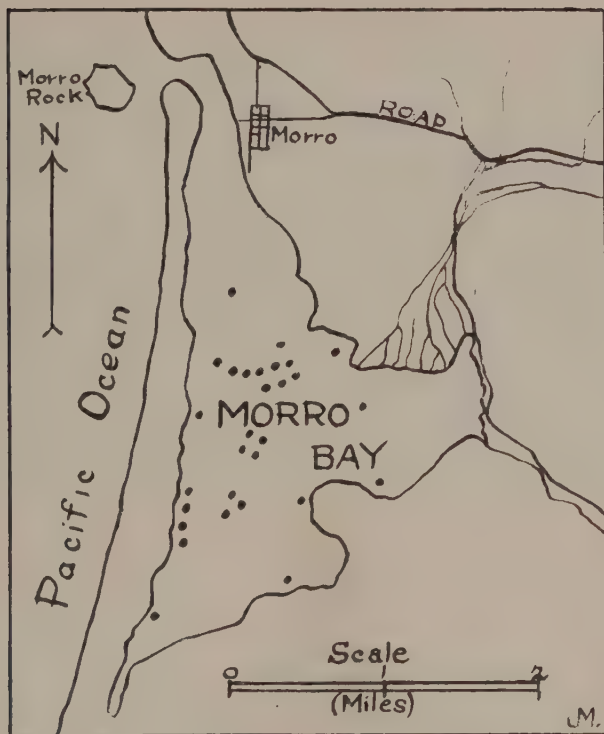


Fig. 75. Morro Bay, San Luis Obispo County, California (after U. S. G. S. Topo. Map), showing location of brant on its waters, 10 a.m., February 10, 1932. Dots represent 100 birds each.

all of the various arms, all of which I was at least able to glass though I did not quite perfectly cover the upper end of the Estero de Liman-tour. I counted 2108 brant. Almost all of these were counted bird by bird. I enclose a tracing from the topographical map showing where the flocks were [see Fig. 74], though towards mid-afternoon there was some shifting back and forth."

I made the count on Morro Bay, February 10, 1932, commencing at 9 a.m. and finishing at noon. Apparently all the birds were feeding in the bay as no flock was seen interchanging position between it and the ocean. The tide was low (1.6 ft.) at 6.44 a.m. and high (4.6 ft.) at 1.21 p.m. The day was partly cloudy with a moderate west wind which blew with increasing intensity up to noon. The accompanying map (Fig. 75) shows that most of the birds were found in the center of the bay. This was contrary to the condition that existed in 1931 when the brant were concentrated in the lower, or southeast end of the bay. A very satisfactory count was secured, mainly because there were no fishermen or other boats out to interfere with my work and disturb the birds.

Mr. L. M. Huey kindly searched Mission and San Diego bays for brant on February 12, 1931. He wrote the next day as follows: "I spent yesterday afternoon scouring San Diego and Mission bays for brant, but was unsuccessful in seeing a single individual. I selected the most promising time for this search, which was the lowest possible tide with afternoon light enabling me to use glasses and scrutinize most of the large flocks of water birds that had sought the mud flats as their feeding grounds. I called up Mr. Glidden and he reported seeing six brant about a week or ten days ago at the south end of the bay, and I believe Mr. Gander saw a half dozen brant near Coronado during our Christmas bird census." Apparently brant are becoming scarcer annually on Mission and San Diego bays. Evidently too much human activity, especially boating and shooting has all but succeeded in driving this bird away from what was once one of its favorite wintering grounds.

The black brant census work has already provided highly interesting indications in regard to the migration of these birds to and from our waters. It now appears that this goose's migratory flight along the Pacific Coast is quite unique in that the majority of the birds apparently fly far south into Lower California waters in November, where they remain until late December to gradually work northward into our bays and probably those of Oregon and Washington during late December, January and early February. Thus we have a continual southward flight of brant along our coastline during November and early December with little or no halting of the birds in our waters. Our real winter and spring visitant brant do not ordinarily appear until December and are not abundant on our bays until mid-January or later. Evidence, as later provided in this paper, points to the fact that these birds come to us from the south, rather than from the north as one would naturally believe. Our brant population reaches its maximum in February, when it remains about constant until early April when the true northward migratory flight to the breeding grounds commences. This continues in full swing throughout this month and by May, most of the birds have left us. A few belated migrants linger on our waters into May, some, mainly immature birds, not leaving before the latter half of that month. That all Lower California wintering brant do not leave its coast in mid-winter is attested by the fact that some flocks of these birds are noted flying northward along our southern coastline at the time of the main migratory flight in April.

Evidence in support of this theory is as follows, no contrary evidence has yet reached my attention. Mr. Silva, professional brant hunter of Morro Bay, a man thoroughly familiar with the habits of this bird, told me that as usual there had been a continual southward movement of these birds past that point for thirty days commencing November 10, 1931. None of these birds stopped over at Morro Bay longer than to rest there a few hours. Silva said that the first birds to stop in the bay appeared about December 15 and that these and those arriving later *came from the south*, as, he stated, they always do at this season.

I visited Tomales Bay November 11, 1931, where I noted but two flocks of respectively 33 and 26 brant on that date. Mr. Henry J. Jensen, of Hamlet, told me that he saw the first brant of the season



Fig. 76. Mounted specimens of black (left) and eastern or light-bellied brant, from the collection of C. Littlejohn. Photo by James Moffitt.

there on November 8, a flock of about 100 birds. I next visited Tomales Bay December 15, 1931, when I counted 404 brant on the outer bay and adjacent ocean. These birds were evidently new arrivals, possibly belated southbound migrants or perhaps the vanguard of the northbound birds from Lower California, for they had not yet adapted themselves to the bay and flew about the outer bay and adjacent ocean in a nervous manner. Brant, when settled on Tomales Bay, have regularly timed flights between the ocean and their feeding grounds on the inner bay near Hamlet, which are dependent upon tidal conditions. At this time, Jensen advised that southbound groups of 50 to 100 birds per flock had straggled past the bay from November 10 to date and that at no time prior to December 15 was any greater number of birds present on the bay. Brant were later than usual in becoming common on Tomales Bay last winter and there were scarcely 1500 birds present on my next visit to the region January 6, 1932. Indeed, as previously stated, maximum winter numbers were not reached by census-taking time February 11, for on a later visit to the bay, March 16, more birds were noted than in February.

If weather is any factor in governing the time of arrival of brant to our waters and if the birds reach us from the north, as is the case with most migrants breeding to the north of us, then we should expect the brant to have arrived earlier than usual last winter, which was an unusually early and heavy one. That the contrary was the case is in favor of the supposition that our wintering brant reach us from the south and that the severe weather possibly delayed their movement northward. In furtherance of this theory, it may be pointed out that brant became common on Tomales Bay early in the fall of 1930 and 3087 were counted there on December 16, 1928, both of which were

light, late winters. (See CALIFORNIA FISH AND GAME, Vol. 17, No. 4, p. 398.)

Mr. T. T. McCabe writes as follows regarding an incident witnessed by him at Drake's Bay, February 11, 1932, which is in further support of this supposition: "I ate my lunch on the beach under the cliffs a little east of the sandpit and while I was there, a flock of 18 brant swung up the shore toward Point Reyes, and followed the shore until they got opposite the life saving station, where evidently they could see across to the outside. Here they abruptly changed their course and swung across the neck. In other words, this small flock seemed to be traveling northward along the coast. They did not come out of Drake's Bay."

I was at Humboldt Bay January 20 and 21, 1932, when brant were just commencing to reach that place in numbers. I estimated that not more than 3000 of these birds were then present on South Bay and residents said they had arrived within the preceding three or four days. This makes the date of their first arrival there about January 16, or ten days later than when 1500 birds were seen by me on Tomales Bay some 170 miles to the *southward*. If the birds come to our waters from the north, we should expect them to reach Humboldt Bay before Tomales Bay, that the contrary is the case suggests that they fly northward from the south of us. January 18 was a stormy day with a strong south wind at Humboldt Bay. January 20, fishermen who had been outside Humboldt Bar or entrance on January 19 stated that "flocks of one or two hundred brant were continually arriving from the *south*" throughout that day.

In order to confirm these indications regarding the black brant's migration, information relative to the manner of the birds occurrence



Fig. 77. The same birds shown in Fig. 76. Eastern brant (left) shows the lighter undersurface and narrow collar. Photo by James Moffitt.

to the north and south of us is imperative. I addressed several persons in regard to the status of brant in Lower California waters, whence few data are available. The only information I was able to secure was kindly provided by Mr. L. M. Huey and is partly corroborative of this theory. I quote from his letter as follows: "Your idea of the brant making a non-stop migration to Lower California in early fall seems quite feasible, as this seems to check with such information as I have been able to get from my fishermen friends who visit the large lagoons on the west coast of Lower California. They tell me that brant congregate in vast numbers there during December, January and parts of February, but toward the end of February, begin to disappear. This was the condition I found when in San Ignacio Lagoon and Pond Lagoon during April 1927. At that time, only about 200 brant were seen, which according to Captain Seely, was but a drop in the bucket to those he had seen during January in the same locality."

In response to my inquiry relative to the manner of occurrence of black brant in the Puget Sound region, Mr. J. A. Munro, Chief Federal Migratory Bird Officer for the Western Provinces of Canada kindly wrote as follows, February 24, 1932: "I have no definite dates of arrival and departure, but I can say with certainty that black brant do remain in the Gulf of Georgia in considerable numbers during December and January. All reports of hunters indicate that an increase occurs in February and that the first southern flight is in November." I expect to secure more data relative to this bird's winter occurrence to the north of California, particularly in Oregon and Washington this winter, which information I will publish later.

Another factor, aside from weather conditions, has suggested itself to me as perhaps influencing the Pacific Coast black brant migratory flight, namely that of food supply. It may be that the food of these birds in Lower California becomes depleted in mid-winter forcing some of them back north to more plentiful feeding grounds long before the true migratory flight commences. It also seems more than merely a coincidence that black brant appear on Tomales Bay (also Morro and Humboldt bays, I am told) coincident with the first spawning of the Pacific herring (*Clupea pallasii*). This fish deposits its eggs upon eel grass and other marine vegetation. The first spawning schools of herring come into Tomales Bay ordinarily between November 15 and 21 and at first spawn on isolated patches of eel grass about the bay. Later in the season, when the herring run is at its height, the fish spawn on practically all of this grass in the northern third of the bay. The brant arrive on Tomales Bay shortly after the herring commence spawning and their partiality in feeding on the isolated patches of eel grass that have been spawned on by this fish is shown by their concentration at these points along with gulls, loons, scoters and other fish and spawn eating birds. In fact it is through the presence of these birds that the fishermen locate the schools of spawning herring.

The photographs accompanying this paper are published to indicate the differences in plumage between the black brant (*Branta bernicla nigricans*) of the Pacific coasts of America and Asia from the eastern or light-bellied brant (*Branta bernicla hrota*) of our Atlantic seaboard. The black brant breeds on the Arctic coasts and islands of Siberia from the Taimyr Peninsula eastward across northern America to Coronation

Gulf and on the islands east to about longitude 100° W. It winters south on the western shores of the Pacific to Japan and northern China and on the east from Vancouver Island south to Magdalena Bay, Lower California. The eastern brant breeds in the Arctic regions of eastern North America and in the Canadian Arctic Archipelago, from about 100° W. Long. eastward and south to latitude 74° N., on both western and eastern coasts of Greenland south to 70° N. Lat., and on the Spitzbergen Archipelago. It winters chiefly on the Atlantic coast of the United States from New Jersey to North Carolina, casually south to Florida, and also on the coasts of northwestern Europe. The European brant, the third member of this species, breeds in northern Europe and Asia from Novaya Zemlya to the Taimyr Peninsula, in Franz Josef Land and on Kolguev Island. It winters on the coasts of northwestern Europe.

Occasionally, but very rarely, eastern brant are reported from the Pacific Coast and black brant from the Atlantic Coast. These occurrences are regarded as casual stray birds. Thus there is one known record of the light-bellied or eastern brant's occurrence in California, an adult male taken near Bird Island, Arcata Bay, Humboldt County, January 30, 1914 (H. C. Bryant, *Condor*, xvi, 1914, p. 183). Doubtless other eastern brant have been killed in California and their capture either not reported or recognized. Sportsmen securing specimens of this rare bird in California are urged to report the fact or preferably to send the specimens to the California Museum of Vertebrate Zoology, or to this Division. The eastern brant apparently occurs more often on the Pacific Coast in the Puget Sound region. Major Allan Brooks has recorded it from Comox, Vancouver Island, several times and states that "about 8 per cent of the brant in Comox Bay are the eastern species." Conversely the black brant has occasionally been reported from the Atlantic Coast, thrice in New York state, twice each in Massachusetts and New Jersey. While the black brant's migration route is along our coastline, it is not infrequently recorded from the Sacramento and San Joaquin valleys and has also been taken as far inland as Pyramid Lake, Nevada, and even on the Bear River marshes of Utah.

For a long time, the black brant was considered to be a species separate from the eastern and European birds. In fact, many authorities and even the latest (fourth) edition of the *American Ornithologists Union Check-List of North American Birds* (1931, p. 38) consider it a full species, which means that it has not been found to interbreed or "intergrade" with either the eastern or European birds. While the nesting grounds of the black and light-bellied brant apparently meet in northern America between 100 and 110 degrees West Longitude, I know of no single specimen ever having been procured in America showing indications of interbreeding. The breeding range, however, of the black brant meets that of the European brant in the region of the Taimyr Peninsula in northern Siberia, where some authorities believe that intergradation between the two birds may exist. Hence, J. L. Peters in his *Check-List of Birds of the World*, Vol. 1, 1931, p. 149, follows the opinion of Schioler (*Danmarks Fugle*, Vol. 1, 1925, pp. 497-523) and of others in considering both the black and light-bellied

brant as simply subspecies of the European bird. This is the form of nomenclature that I prefer to follow.

The black and light-bellied brant are about the same size, though specimens I have indicate that the Pacific Coast bird is slightly the larger. Plumage patterns are identical in both subspecies; but the belly (see Fig. 78) and the back (see Fig. 76) of the eastern brant are very much lighter than in the black brant. Again (see Fig. 77) the collar partially encircling the neck of the eastern bird is much more



Fig. 78. Study skins of adult female black brant (left) and eastern brant, from the author's collection. Photo by James Moffitt.

developed in the Pacific form. These are about the only marks distinguishing the two forms, which are said to be identical in habits, voice, flight, etc.

It is a pleasure to state that the report of the First Annual Black Brant Census brought many letters and expressions of commendation from California sportsmen. It is hoped that this second report will be similarly received that this work may be continued as an annual event. Thanks are again due to the voluntary cooperators. It would indeed

be gratifying if interested parties to the north and south of California could arrange to take similar census at places of brant concentration along the whole Pacific coast from British Columbia to Lower California; in which way a complete census of the number of these birds wintering in America might be obtained. Persons so interested are invited to correspond with the writer in this regard with the promise of his complete cooperation.

ATAVISM IN A CALIFORNIA HALIBUT

By J. B. PHILLIPS, California State Fisheries Laboratory

ATAVISM is a biological term meaning the recurrence in a descendant of characters of a grandparent or more remote ancestor, in other words, reversion to a more primitive type.

A flatfish that had developed pigmentation on most of its lower side as well as on the upper side was an object of interest at one of the Monterey fresh fish markets on March 25, 1932. This flatfish or flounder, 27 inches long and $8\frac{1}{2}$ pounds in weight, was a specimen of the California halibut (*Paralichthys californicus*). The specimen was normal in every respect except for the atavistic pigmentation. Ordinarily the California halibut, as well as all members of the flounder family, develop coloring only on the top side, and the lower or blind side remains white or colorless. In the present specimen not only did the top side have the characteristic greenish brown coloring but the lower or blind side, except for the head region, was also colored a dark brown, the same shade as on the upper side but lacking the greenish tinge.

The flounder family of fishes, including the flounder, halibut, sole, turbot, and plaice, is an interesting group of fishes with us today, which demonstrates the working of evolution. Throughout the centuries, the flounders apparently have evolved from an ordinary symmetrically built pelagic form to the present unsymmetrical bottom form. The flounders still retain their ancestral characteristics in their early development. The eggs of the flounders are pelagic and free-floating in the water. When the larvae hatch from the eggs and for a short period thereafter, the young are normal and symmetrical as are other true fishes. The young after a short period, however, settle down on the bottom, developing the characteristics by which they are easily identified. The cranium and bones of the head become twisted, one eye migrating over to the other side so that both eyes are on the same side of the head. In the meantime, the body becomes flattened dorso-ventrally. The flounder's normal position in the water is with its blind side to the bottom, which permits the fish to lie flat on the bottom or to cover itself partially with sand. When it is lying on the bottom, the protective coloration of the exposed side makes the fish invisible to its enemies. The flounder swims by undulations of its body and fins, with its blind side down.

The bottom habit of the flounder has resulted in a lack of pigmentation development on the lower or blind side of the body so that it

is white or colorless on this side. The upper side on the other hand has strongly developed coloring. That this pigmentation is due to the effects of light has been shown by various experiments. Perhaps one of the earliest and most effective experiments was performed by J. T. Cunningham,* who worked with plaice. The plaice were confined in an



Fig. 79. A California halibut (*Paralichthys californicus*) that had developed pigmentation on most of the lower or blind side as well as the top or eyed side. Photo by J. B. Phillips, March, 1932.

aquarium and all light shut out except that which was reflected from a mirror on the bottom of the tank. He chose young plaice that had developed to the point where they had just lost their symmetry and had settled to the bottom. The results of his experiments showed that in the earlier stages of its development the plaice persisted in its acquired tendencies of no pigmentation development on the lower or blind side.

* Cunningham, J. T. An experiment concerning the absence of color from the lower sides of flat-fishes. *Zool. Anz.*, vol. 14, p. 27-32, 1891.

However after about two weeks, pigmentation began developing on the bottom side. The coloration first started along the margins of the sides and worked inwards, finally covering the entire side.

It might be surmised that the present specimen lived over a shallow bottom that had a composition which reflected light such as in Cunningham's experiment. However, this is highly improbable in that more specimens with the same characteristic would have been taken from that same area. The most feasible explanation is that the halibut had for some reason lost its sense of equilibrium. When away from the bottom, it was just as apt to turn bottom side up as top side up. That fishes and other marine animals can lose their sense of equilibrium has been demonstrated by experimenting with the inner ear cavity.

Other instances of atavism around us today are the occasional presence of three toes on a horse's leg and the extension of the spinal column to form a tail in some humans.

SPORTING TACKLE FOR SPORTIVE STEELHEADS

By TOD POWELL

(With three photographs by the author) *

A LONG THIS Pacific coast of our Golden State is the habitat, natural environment and home of the fightin'est freshwater fish that ever flang his lip over a hook. You of the anglers' clan know "whatof" I speak—the steelhead of our coastal streams—the he-battling fish that lures Waltonians from the world around.

Big Sur, Carmel, Soquel, San Lorenzo—at seasons you'll find the finned scrappers in these streams. Pescadero and San Gregorio—you'll find the husky steelhead there, too, when the bars are open in the latter part of winter. And then there's the Papermill Creek of Marvelous Marin and the White House Pool near Point Reyes, and a jump farther north to the Russian River with its Duncan's Mills, Bohemian and other pools.

The Gualala, Garcia, Navarro, Albion, Big, Noyo, Mattole and many another stream up coast are splendid steelhead waters. But all of them are comparatively minor to the Eel in the heart of the Redwood Empire, and the mighty Klamath, the great daddy of all California fishing streams, the one by all the rights of the gods and the laws of man that should forevermore be kept entirely free for the perpetuation of the grand and glorious salmon and the tackle-smashing steelhead. This river is the one last stream of consequence in all the thousand-mile coastline of California which could be set aside for salmon and steelhead to insure their kind against extinction.

Tackle! Steelhead tackle! That's my subject, but I wandered afield, or rather upstream as it were, with my enthusiasm locating pools and riffles for you.

* These photographs released for use or reproduction only as illustrations for Tod Powell's article, "Sporting Tackle for Sportive Steelheads" in CALIFORNIA FISH AND GAME, Volume 18, number 4, October, 1932.

Inasmuch as fly fishing is by far the sportiest manner in which to take steelhead, whenever and wherever it is possible, the matter of that type of tackle will be taken up first.

Fly rods for steelhead fishing should be powerful—ample of backbone, plus—enough power to withstand the strain of continual casting of a long heavy line. The dashes of big fish in strong water currents will give a rod great strain, but the action is quite different and not

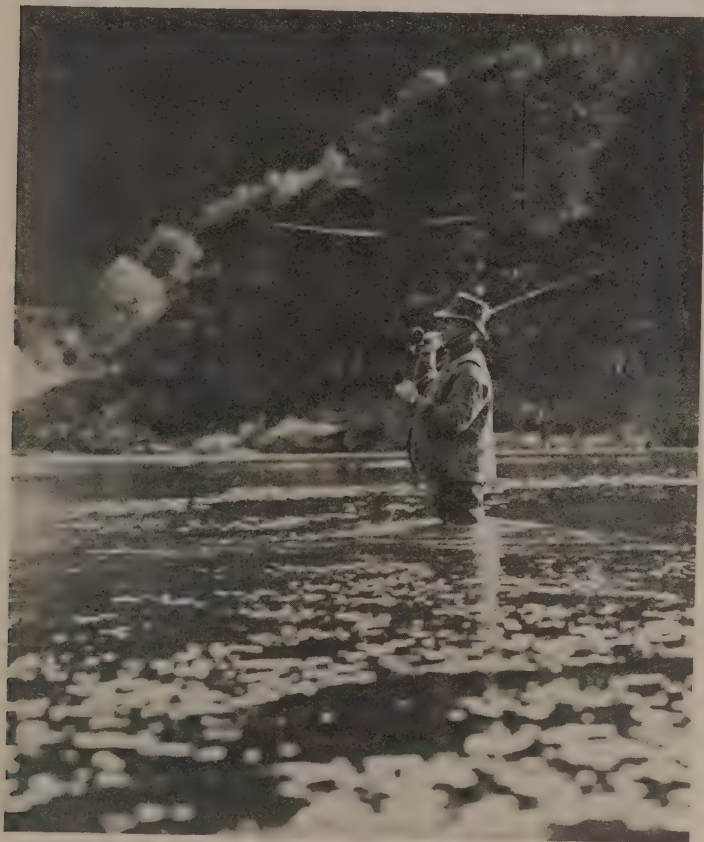


Fig. 80. Whipping the mighty Klamath with a fly for the he-battling steelhead that lures Waltonians from the world around.

nearly so violent to the rod as it is when you retrieve your long line—pick up your cast—from heavy water. Light rods are not to be recommended for steelhead fishing. They will land fish, to be sure, but the punishment from this type of fishing will be too much for them, and that isn't fair to a fine fly rod.

A sturdy 9-foot rod of from $5\frac{3}{4}$ to $6\frac{1}{4}$ ounces may be used successfully, but unless you are some inches above six feet in height you had

better use either a 9½- or 10-foot rod. This additional six or twelve inches is to offset some of your depth wading waist deep in the stream, as it will require all of the reach it is possible to command to clear the long forward cast and then pick up the retrieve against water friction. A 9½-foot rod should weigh at least 6 ounces preferably a half to three-quarter ounces more, and a 10-foot one should weigh from 6¾ to 7½ ounces. Once, on the Rogue, I used a 10-foot rod weighing only 5¾ ounces. It was a grand rod, but most assuredly it was an exceptional one—one in thousands.

The long 7-ounce—or more—rod would readily become a very tiresome piece of equipment in case one wielded it all day long on an ordinary trout stream, but for the period the best steelhead fly fishing is really on—an hour and a half or more before sunset—it isn't such a task to work the big stick, especially if you have some activity on the water-terminal of your line. My old pet heavy bamboo became very light one evening when I fed a whole pear-picking crew along the river by taking on a fly, five snorting good steelhead, total weight 39 pounds.

The best rods for steelhead fly fishing are specially hand-made by skilled artisans, but any fly rod, regardless of price, which has the power and specifications mentioned above will give you what you want—the capacity to cast properly a fairly long line and to stand up under heavy work. As this sort of fishing is done *with the rod*, your selection should be centered on this part of your equipment—not, however, neglecting the other items used.

For steelhead a single-action fly-reel is best. In trout fishing your reel is more or less just a house for your line, but in steelhead fishing you want a better reel and a larger reel. It should, by all means, have an adjustable tension, because when one of these fellows takes your fly and starts away with it, he goes places at express speed and a reel which has no braking action, click tension or adjustable tension of some kind is quite likely to race on and on with the burst of speed, thus causing your line to backlash and creating a snarl that means the end of that particular catch right then.

The reel should have capacity for a full 30-yard fly-casting line, with about 250 feet of backing. Steelhead often make an initial run of more than 75 yards and if you haven't the line there to take care of it—good-bye fish! The best of the reels have been made in England, but of late years American tackle-makers, appreciating the demand for a high-class product, have turned out reels that will do the work quite as acceptably.

As for a line, the best is a fairly heavy double-tapered product of at least 30-yard length and of soft smooth finish. The newly developed triple-tapered line has added advantages, especially on lighter weight rods. The reel and line should balance your rod, and achieving this balance by fitting a line to the already selected rod and reel is a job for an expert. Here is one place where you should deal with a salesman you can trust, at least until you have acquired knowledge through your own experience.

Spliced to this tapered line should be your backing, and this can be either light-weight braided silk or cuttyhunk. Be sure the splice is small, smooth and even, that it may run readily through the guides of your rod. The best of the tapered lines, like the reels, originated in

England but very good ones are being made in this country now—very carefully dressed and vacuum-filled so that they are smooth and firm.

Of course steelhead can be caught without using a tapered line—some people have taken trout on thread and a bent pin—but a tapered line makes for a cleaner cast and the weight back of the taper takes the line out far better.



Fig. 81. The "Strip caster" in action.

Leaders for the steelhead fly game preferably run around $7\frac{1}{2}$ feet in length and may be either level or tapered—I prefer the tapered—but in any event should be of absolutely first quality. Steelhead leaders should be without loops, as in this sort of fishing the use of but one fly is decidedly sound ethics.

Flies for steelhead are generally large, number four or number six, are tied wet mode and fished wet. Sometimes a number eight is

used, depending on whether the water is clear or not. The hooks should be sturdy ones, never the delicate Sneek bend or such models. Most of the successful flies are gaudy contraptions that look like nothing a fish ever ate or saw before, though of recent years the more modest buck-tails and streamers have been used to advantage.

A great many of these flies show red but there is no more exact rule for selecting this color than for any other department of angling, unless some steelhead, sometime, may advise that the red in fly-tie gives semblance to his favorite tid-bit, the roe. It is a good idea to buy your flies from a dealer who lives near the water you intend to fish and knows something of the local idiosyncracies of the fish and stream.

Some flies have been developed especially for steelhead and, consequently, have been named for California anglers whose catches of this heroic battler have won them fame. Among them are the Carson, Soule and Sam Wells. The Railbird, Kate, Red Ibis, Royal Coachman, the old reliable Parmachene Belle and the March Brown are other flies frequently used with success. Most of these are additionally millinered with a couple of feathers from the neck of India's sacred bird, the Jungle Cock.

Steelhead flies ordinarily are not snelled and should properly be tied by the angler to the leader of his choice.

A net or gaff is very nearly useless and not quite the sporting thing anyway in fly fishing for steelhead. The best way to land this fish is to wear him down by skillful angling and then beach him. And a creel or basket for he-sized steelhead is out of the question.

Fly-fishing, desirable as it seems to many, is not, however, the only means of taking steelhead. There are a percentage of fishermen who prefer to use spinners or bait. In spinner fishing a heavy fly-rod can be used but it is not advisable, as the strain takes the action out of it and deprives it of the very thing for which it was made and purchased—the finely actioned ability to make a long and accurate cast.

For this sort of fishing, especially when done from the shore, the lure-casting rod used for bass and other spiny-rayed fish is both preferable and superior, and split bamboo is superior to steel. Many anglers use a 5- to 6-foot rod; the foreign type of spinning rod, a few feet longer, makes a sportier outfit and gives more flexible action.

In this type of fishing the reel is of greater importance than in fly fishing. Consequently you will wish to give more attention to the reel used for this sort of work than to the rod. One of quality with a low, wide spool and quadruple action should be selected. Ones made in America lead the world.

For a line, silk, the ordinary bait-casting line, but not too heavy gauge. A line with a breaking strain of 12 to 15 pounds makes casting easier and since you're not out to land your fish with an anchor chain and windlass, why not use the sportier tackle anyway?

And don't forget that a hundred yards of line will seldom, if ever, be too much.

You will need about a 6-foot leader for this sort of work—and, of course, it should be proportioned in strength to the line you are using.

Spinners numbers 3 or 4 are most used. Some anglers use brass, some copper, some copper and nickel and some use all three, or rather four in the additional case of the nickel and copper reversed.

And many spinners used are made up with red glass beads on the shank. The matter is one of individual taste and water conditions. The copper-nickel spinner is often used more successfully when the water shows murkiness.

It is a well known fact that the steelhead follow the salmon upstream and are voracious eaters of salmon roe. Therefore salmon eggs, which can be obtained ready prepared in jars or tins are good bait. So also is the roe from freshly caught salmon and even the roe from steelhead.

In the winter runs, the steelhead very seldom takes a fly. It is my opinion that a steelhead rarely, if ever, takes a fly as bait anyway, but is instead attracted or angered by the flash of the bright color the same as the flash of a spinner will rouse him to action. For this reason in winter, with more or less murky rain run-off making bottom fishing



Fig. 82. In mid-winter on the Gualala, anglers of both sexes are to be found tossing "strawberries" on barbed hooks at unsuspecting steelhead.

the rule, it seems a spinner or salmon egg, or preferably a bunch of salmon eggs, tied up in cheesecloth, maline or tulle—colloquially known as a "strawberry"—is the best lure. It can be improved by use of red fabric to contain the eggs and red thread for tying it up.

Many anglers who go after steelhead in the late season are now making use of a method developed, I believe, in California and called "strip casting." This method has the advantages of great speed and convenience. For it the angler provides himself with the wire filing basket from his office desk, a folding canvas washbasin or some similar tray-like container which he attaches to the front of his belt. He uses a sporty 9- or 10-foot rod, a free running reel and a good hard-braided silk line. Sometimes the line is waterproofed, as the fishing is usually in brackish water, the reaches of tidewater. Sometimes, too, the line is made up of 40 or 50 yards of synthetic Japanese gut leader backed

with the same amount of silk or cuttyhunk. This gut becomes very flexible and free-running when wet. A light bell sinker is used on the line.

With this outfit the fisherman simply strips the line from his rod after every cast and arranges it in coils in his basket or tray before him. Then when he casts again it picks up very rapidly and, because of its extreme flexibility, the accuracy of his cast is limited only by his own skill.

Waders and felt-soled shoes are the accepted garb of the steelhead fisherman. Hip boots are, almost without exception, useless in the heavier steelhead rivers. In case you are fishing heavy waters and are ill at ease regarding the safety of waders, you can step out in wool sox, wool underwear, wool trousers and either felt-soled shoes or brogues with hobs. However, this takes a pretty hardy constitution, for steelhead waters in the fall and winter are cold and most of us cannot stand the chill which they set up.

With equipment such as I have outlined above a man may enjoy steelhead fishing for what it is—a fair battle between a smart, gamy fish and a man who has deliberately reduced the odds given him by his intelligence and physical strength to a point where he is somewhere near fish-size. I have seen many men on the rivers after steelhead with deep-sea rods and lines and everything else in proportion.

Personally, I see no more real sport in this than in shooting tame quail on the ground. If you eliminate the difficulties of a sport you've eliminated its charm. Sporting tackle for sporting fish, say I—and leave the other stuff to the meat-hunters.

THE WHITE SEA-BASS AND RELATED SPECIES THAT ARE SOLD IN CALIFORNIA FISH MARKETS¹

By R. S. CROKER

FOR SEVERAL YEARS California fresh fish markets have been selling several closely related species of fish under the names "white sea-bass" and "corbina." Prior to about 1927, however, the only species sold under the former name was the true white sea-bass (*Cynoscion nobilis*), and no fish called corbina was offered for sale. At present, California fishermen operating off the Pacific coast of Lower California catch several species quite similar to the white sea-bass and dealers sell them under the names "white sea-bass," "sea-trout" and "corbina." In addition Mexican fishermen, operating in the Gulf of California, ship two other similar species to California dealers under the names of "corbina" and "white sea-bass" or "totuava." All six species are so much alike that a casual observer would not distinguish them.

¹ Contribution No. 127, from the California State Fisheries Laboratory, August, 1932.

The real white sea-bass is protected from overfishing by a closed season and a minimum size limit,² but the related species are not. This article has been prepared to enable fishermen, dealers and law enforcement officers to distinguish the various species so they may avoid unintentional violations and unnecessary arrests. This paper also attempts to untangle the existing confusion of common names so that wholesale and retail dealers will be able to sell each species by its individual name and so the consumer will know just what species of fish he purchases.

The California corbina (*Menticirrhus undulatus*) is protected by law.² A description of this species is included in the present article to point out the differences between it and the other corbinas which have no legal protection.

The following key includes all the species of the genus *Cynoscion* (the white sea-bass, gulf corbina and their allies) that are known to occur in the waters of California, Lower California, Sonora, and Sinaloa. If it is not certain that any fish in question is a member of this genus, the use of the key in the "Handbook of Common Commercial and Game Fishes of California"³ is recommended. If the specimen keys down to section 95 (page 22 of the Handbook), it is a species of *Cynoscion*. As the key in the Handbook includes California species only, the following key has been prepared to take the place of section 95. Figure 83 illustrates the anatomical terms employed in the present key.

² Consult current fish and game laws for details of these regulations.

³ Walford, Lionel A. Handbook of common commercial and game fishes of California. Calif. Div. Fish and Game, Fish Bull., No. 28, p. 13-25, 1931.

A KEY TO THE IDENTIFICATION OF THE SPECIES OF CYNOSCION THAT OCCUR ON THE PACIFIC COAST OF MEXICO

1. IF: The anal and second dorsal fins are densely covered with small scales, the fish is a Gulf Corbina (*Cynoscion othonopterus*). See page 321.
 BUT IF: There are no scales on the anal and second dorsal fins, see section 2.
 (Note: The low sheath of scales at the base of the fins is not to be confused with the scaly covering that extends over nearly the entire fin of the Gulf Corbina.)

* * * *

2. IF: The back is covered with dark horizontal streaks and there is a light stripe along the lateral line, the fish is a Striped Corbina (*Cynoscion reticulatus*). See page 322.

BUT IF: There are no horizontal streaks or stripes on the body, see section 3.

* * * *

3. IF: The lining of the mouth is bright orange yellow and the tail fin is yellow, the fish is an Orange-Mouthed Corbina (*Cynoscion xanthurus*). See page 323.

BUT IF: The lining of the mouth is white or pale yellow and the tail fin is dusky, see section 4.

* * * *

4. IF: The anal fin has 2 spines and but 7 soft rays, the fish is a Totuava (*Cynoscion macdonaldi*). See page 324.

BUT IF: The anal fin has 2 spines and 9 or 10 soft rays, see section 5. (Note: The anal spines of all species of *Cynoscion* are often imbedded in skin and consequently hard to see but it is the number of soft rays that is important here.)

* * * *

5. IF: The inner surface of the pectoral fin is black and the pectoral fin reaches to or beyond the tip of the ventral fin when both fins are flat against body, the fish is a White Sea-Bass (*Cynoscion nobilis*). See page 325.

BUT IF: The pectoral fin does not nearly reach to the tip of the ventral when both fins are flat against body, the fish is a Short-Fin Sea-Bass (*Cynoscion parvipinnis*). See page 326.

NOTE.—The California Corbina (*Menticirrhus undulatus*) differs from the Gulf, Striped and Orange-Mouthed Corbinas in the possession of a barbel on the lower jaw and in the possession of a snout that projects beyond the lower jaw. It differs from other related forms in its slim body and in having but one anal spine. See page 327.

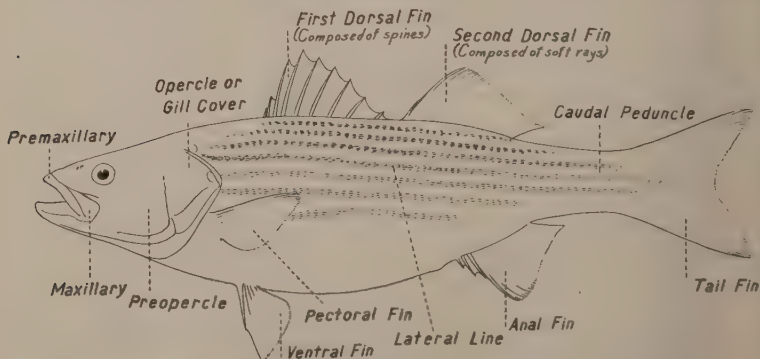


Fig. 83. Illustrating anatomical terms used in key. (Drawing from Starks, 1921.)

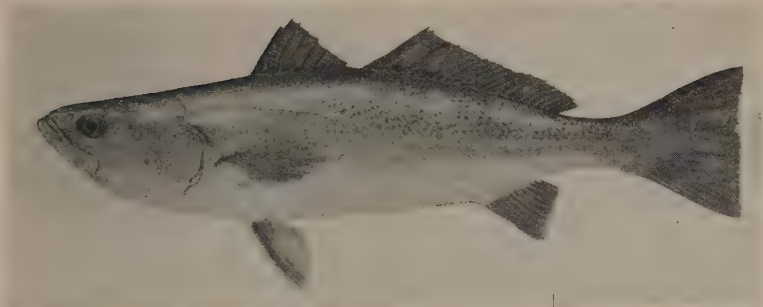


Fig. 84. Photo by Hawthorne Studios, Los Angeles.

GULF CORBINA

Cynoscion othonopterus

Distinguishing Characters: All fins except first dorsal densely covered with fine scales; 23 or more rays in second dorsal fin; pectoral fin barely or not quite reaching to tip of ventral fin; 1 or 2 long canine teeth in upper jaw, with 3 smaller ones on each side of them. *Color:* Steel blue above and on the sides, becoming silvery below; fine dark points everywhere; lower fins yellowish; pectoral, dorsal and tail fins dusky.

Distribution: Gulf of California.

Fishing Season: Autumn, winter and spring.

Importance: Commercially the most important of the corbinas; 1931 deliveries to California markets exceeded 115,000 pounds. Shipped overland by truck from Gulf ports to San Pedro and Los Angeles.

Fishing Gear: Hand lines, set lines

Unauthorized Names: Mexican corbinn, sea-bass, sea-trout.

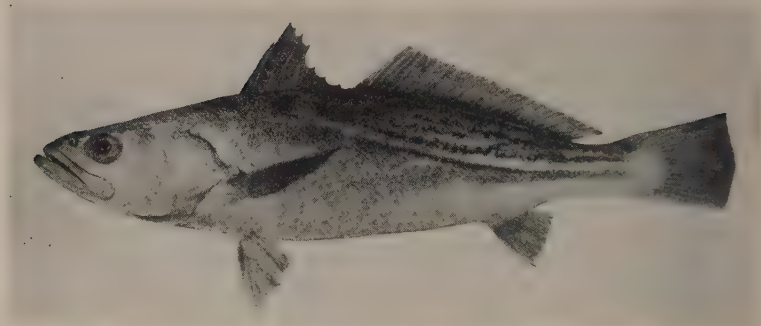


Fig. 85. Photo by D. H. Fry, Jr.

STRIPED CORBINA

Cynoscion reticulatus

Distinguishing Characters: All fins without scales; pectoral fin inserted directly above ventral fin insertion and its tip reaching beyond tip of ventral fin; back covered with dark brown streaks; lateral line in a light stripe bordered above and below by darker ones. *Color:* Back and sides marked as described above; belly silvery; lower part of sides, head and tail with many small dark points; tail fin yellow; inside of mouth orange.

Distribution: Lower California south to Panama.

Importance: Not brought to California in commercial quantities.



Fig. 86. Photo by Hawthorne Studios, Los Angeles.

ORANGE-MOUTHED CORBINA

Cynoscion xanthurus

Distinguishing Characters: Soft fins scaleless; no horizontal stripes; pectoral fin just or not quite reaching to tip of ventral fin; inside of mouth bright orange; tail fin yellow. *Color:* Bluish above and on sides; silvery below; sides and back with many small dark points; lining of mouth orange yellow; tail fin yellow.

Distribution: Pacific coast of Mexico.

Fishing Season: Brought to California ports during the fall, winter and spring.

Importance: Of minor commercial importance.

Fishing Gear: Hand lines, set lines.

Unauthorized Name: Sometimes miscalled sea-trout.

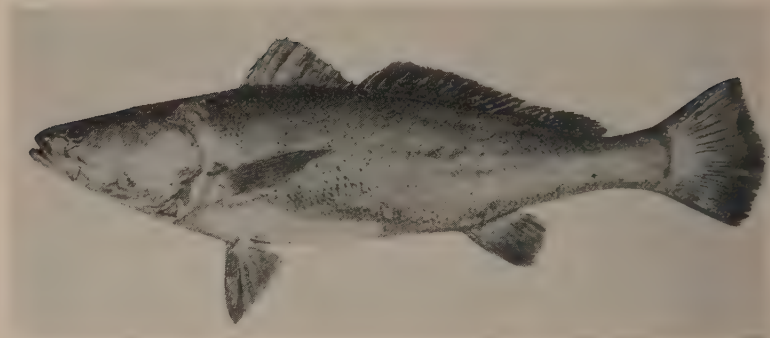


Fig. 87. Photo by Hawthorne Studios, Los Angeles.

TOTUAVA

Cynoscion macdonaldi

Distinguishing Characters: Fins without scales; no horizontal stripes on body; anal fin with 7 soft rays; lining of mouth pale yellow; tail fin dusky. **Color:** Metallic, bluish gray above, becoming dusky silvery on sides and belly; tail fin dark, other fins pale. Young with coarse black specks along lower part of the head and sides; back with many irregular spots which disappear with age. **Size:** The females attain to a weight of over 200 pounds; the males are said to be much smaller, seldom exceeding 75 pounds.

Distribution: Gulf of California and mouth of Colorado River.

Fishing Season: Fall, winter and spring.

Importance: One of the most important species handled by California fresh fish markets; 1931 deliveries in California were over 1,300,000 pounds. Shipped overland by truck from fishing towns on Gulf to San Pedro and Los Angeles. Also shipped by truck and rail to Arizona cities. A soup stock, which is popular with Chinese, is made from the air bladders of the large females. Sportsmen hold this fish in high esteem.

Fishing Gear: Hand lines, set lines, spears.

Unauthorized Names: Mexican sea-bass, white sea-bass. The Mexican fishermen call the males "machorro" and the females "totuava."

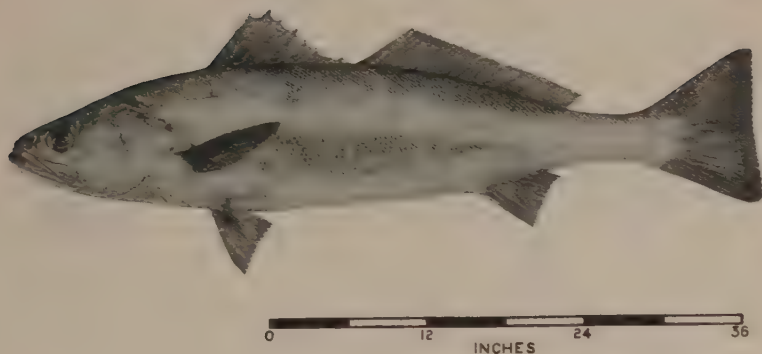


Fig. 88. Photo by Hawthorne Studios, Los Angeles.

WHITE SEA-BASS

Cynoscion nobilis

Distinguishing Characters: Soft fins without scales; no horizontal stripes on body; anal fin with 9 soft rays; pectoral fin extending backward beyond tip of ventral fin when both fins are flat against body; tail fin dusky; lining of mouth white; dark brown or black spot at base of pectoral fin, extending on most of inner face of fin. **Color:** Bluish gray above, frosted silvery below; many small dark points on body; dark spot at base of pectoral fin; all fins dusky. Young specimens have 3 to 7 vertical cross bands on body and an entirely black pectoral fin.

Distribution: Puget Sound to Gulf of California; not common north of San Francisco.

Fishing Season: Legal open season is from July 1 to April 30, at present writing (1932). Maximum landings are during the summer and fall.

Importance: One of the most important species delivered to the fresh fish markets of California. The total catch for 1931 was 1,385,000 pounds, of which 340,000 pounds came from the west coast of Lower California. Largest landings are made at San Pedro and San Diego. Highly esteemed by sportsmen.

Fishing Gear: Commercial—round haul nets, ring nets, purse seines, gill nets, hook and line; sport—hook and line.

Unauthorized Name: The young are sometimes miscalled sea-trout, many fishermen mistakenly thinking they are of a different species.

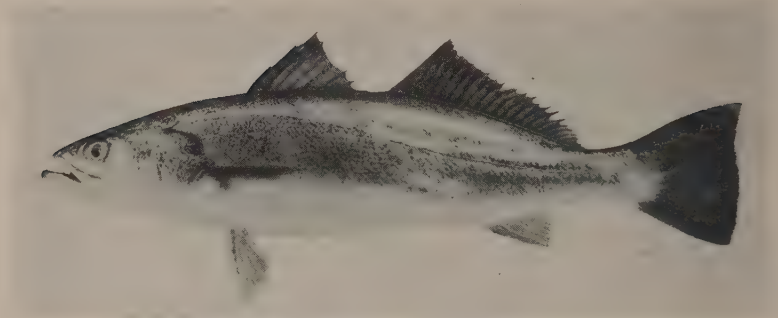


Fig. 89. Photo by Hawthorne Studios, Los Angeles.

SHORT-FIN SEA-BASS

Cynoscion parvipinnis

Distinguishing Characters: Soft fins scaleless; no horizontal stripes; anal fin with 9 or 10 soft rays; pectoral fin short, not nearly reaching to tip of ventral fin when both fins are flat against body; a pair of long canine teeth in the middle of upper jaw; tail fin dusky; lining of mouth pale. *Color:* Metallic, bluish above, lighter on sides and belly; sides and back with numerous small dark points; lower fins white, others dusky.

Distribution: Pacific coast of Lower California, and Gulf of California; occasionally strays as far north as San Pedro, California.

Fishing Season: Brought to California ports during fall, winter and spring.

Importance: Of minor commercial importance at present writing (1932). Forms a small proportion of the white sea-bass catch.

Fishing Gear: Caught in Mexican waters by California boats using hand lines and gill nets.

Unauthorized Names: Incorrectly called sea-trout, bluefish.



FIG. 90. Photo by Hawthorne Studios, Los Angeles.

CALIFORNIA CORBINA

Menticirrhus undulatus

Distinguishing Characters: Barbel on lower jaw; snout projects beyond lower jaw; single spine on anal fin; long, slender body. **Color:** Entirely metallic; steel blue on the back shading into gray on the side and becoming white below; many vague, dark, wavy lines made by dark points in the center of each scale run upward and backward on the back; the back sometimes has faint cross bars; many small black dots are on the lower part of the sides.

Distribution: Point Conception southward into the Gulf of California. Occasionally found as far north as San Francisco. Usually caught close to the shore in the surf of sandy beaches.

Fishing Season: Caught by sportsmen throughout the year.

Importance: At present writing (1932), it is contrary to the law to catch this species with nets or to sell or buy it in California. Held in high esteem by sportsmen.

Fishing Gear: Caught with hook and line from piers or in the surf from sandy beaches.

Unauthorized Names: California whiting, corvina, surf fish.

IMPROVEMENTS IN SARDINE FISHING GEAR IN THE MONTEREY REGION (1930-1932) ¹

By J. B. PHILLIPS

(With three photographs by the author)

PREVIOUS to the 1929-1930 sardine season, the lampara net furnished almost the entire supply of sardines to Monterey sardine plants. During the 1930-1931 and 1931-1932 seasons, the entire cannery supply of sardines at Monterey has been caught by crews using purse nets. The purse nets are of two types: the purse seine and the ring net. The purse seine has evolved through years of use while the ring net is a comparatively recent gear.

The modern ring net came into being at Monterey during the 1929-1930 sardine season. The influx of a large number of purse seine boats during the aforementioned season caused the lampara crews to abandon the entirely hand-operated lampara net in favor of the more competitive semipowered operated ring net.² The ring net gained early popularity. Because of its light construction it can be adapted for use on either the lampara or the purse seine type boats. On the other hand, the purse seine can be successfully used only on a purse seine type boat, while the lampara net can be successfully operated only on a lampara type boat. The purse seine may readily be differentiated from the ring net by the fact that the heavier webbing of the purse seine permits it to be tarred (webbing is tarred but once before using), while the lighter webbing of the ring net is tanned. (Tanning is accomplished by placing the net in a hot tan bark solution, preferably once every two weeks during continuous fishing.)

During the 1929-1930 sardine season about 90 per cent of the ring net crews had the landing bag in the middle of the net. The landing bag is that portion of the net of heavier webbing into which the catch is bunched preparatory to brailing. The rest of the ring net crews had the landing bag at one end as with a purse seine. Having the landing bag in the middle of the net requires more men as the net must be pulled from both ends at the same time. Also the net must be repiled after each haul, but when the bag is at one end the net is piled in position for the next lay-out while the net is being hauled in. During the 1930-1931 season the crews with ring nets having the landing bag in the middle, commenced changing the bag to one end, so that by the end of the 1931-1932 season only about 10 per cent of the crews were fishing with ring nets having the bag in the middle. The original placing of the landing bag in the middle of the net was most likely a carryover of the lampara net which had been in use at Monterey for so many years.

¹ Contribution No. 123 from the California State Fisheries Laboratory, April, 1932.

² Phillips, J. B. Success of the purse seine boat in the sardine fishery at Monterey (1929-1930 fishing season). Calif. Div. Fish and Game, Fish Bull., No. 23, 1930.

Fry, Donald H., Jr. The ring net, half ring net, or purse lampara in the fisheries of California. Calif. Div. Fish and Game, Fish Bull., No. 27, 1930.



Fig. 91. A Monterey lampara boat crew repairing their ring net. This is a common practice with ring nets. The lampara boat unit is not complete without a lighter, used for transporting the catch, which is towed behind the launch. August, 1930.

Former lampara crews now using ring nets have speeded up the laying out of their nets by attaching one end of the net to a buoy instead of the lighter. The buoy is usually a 10-gallon barrel which is weighted so that a protected small light bulb floats uppermost. This bulb is lighted by a dry cell inside the barrel. A lampara boat fishing outfit consisted of a launch and a lighter which was towed behind the launch for transporting the catch. The net was piled on the stern of the launch. When the ring net was first used on this type of boat, most of the crews employed the following procedure when making a set for sardines: When a school of sardines was sighted, the lighter would be drawn up to the launch and one end of the net fastened to the lighter. The lighter would then be cast free and the circle of net laid out around the fish. When the circle was completed and the launch had reached the lighter, the first end of the net was taken on board the launch and the net hauled aboard. This procedure was undoubtedly a carryover of lampara net days. The universal method now is to have one end of the net and also the lighter rope tied to the buoy. The lighter rope between the buoy and the lighter is then given a turn or two around the stern post of the launch. When fish are sighted the lighter rope is freed and the buoy cast overboard. The resistance for pulling the net off the launch is still furnished by the lighter, but when the circle is completed only the buoy is picked up. The lighter is not pulled up to the net until the catch has been bunched preparatory to brailing. On the other hand, the purse seine boats are not handicapped by having to tow a lighter inasmuch as the catch is loaded into a hold on board. A large skiff is taken along, to which one end of the net is made fast. When fish are sighted the skiff is cast loose with sometimes one or two men on the long oars to furnish added resistance, if necessary, to start the net into the water.

A lighted buoy is sometimes used by purse seine boats to mark a small school of fish, while cruising around in the same vicinity in search of a more desirable school.

Another improvement of the lampara boat crews now using ring nets is the use of an electric light for a "scare" while the net is being closed. This consists of an incandescent bulb in a water-tight socket, attached to a waterproof cord. The light is dropped far enough in the water so that the fish are frightened backward and upward from the opening of the net, as the net is being pursed. This method of frightening was introduced by the San Pedro purse seine boats during the 1929-1930 sardine season. Fry (1930) reports that the use of the electric light scare originated in southern California waters during the 1928-1929 sardine season.

The larger purse seine boats on which ring nets have been used are being changed back to purse seines again. At Monterey, the ring net was first tried on the purse seine boat during the 1929-1930 season when four crews, or about 15 per cent of the purse seine boats, used the net. In all cases the turntable was removed and the net piled directly on deck. During the 1930-1931 season about 15 crews, or about 50 per cent of the purse seine boats, used the ring net. However, as the season progressed these crews found that the ring net was not as well adapted to the large boats as might be. Toward the latter part of the aforementioned season, some of the boats commenced replacing their turntables and either used ring nets on the turntables until the nets were badly worn, or directly replaced the ring net with a purse seine. During the 1931-1932 season, about 9 crews, or about 25 per cent of the purse seine boats, were using ring nets. Some of the Monterey owned purse seine boats that used a ring net previously and changed to a purse seine during the 1931-1932 season are: *Pal*, *Francis*, *Ranger*, *St. Joseph*, *Dante Alighieri*, *Serra*, and *Johnny Boy*.



Fig. 92. A sardine purse seine boat of the larger type waiting to unload its fare at a Monterey cannery. Note the long movable boom which is hinged to the mast at the lower end. The hoisting ropes run through the blocks at the top of the boom. This boat is about 80 feet long. February, 1932.

A number of purse seine crews have come from southern California waters to fish in the Monterey region. These crews have all found that the nets used in the southern waters are too long for the same purpose in the northern waters, and have invariably shortened their nets 20–50 fathoms. This has been due to the more compact form of the schools of sardines in the Monterey region. Practically all nets used by purse seine boats in the Monterey region (1931–1932) range between 160–200 fathoms in length.

All of the purse seine type boats in the Monterey region are (1931–1932) using the long bag dip net for unloading of the catch from the net into the hold. These dip nets consist of an iron ring 4 to 5 feet in diameter from which is suspended a bag of webbing 18 to 24 feet long. This bag is closed at the end, terminating in a rope which runs through a block at the end of the movable boom overhead. A long wooden handle, usually the length of the webbing, is fastened to the iron hoop so that the mouth of the dip net can be guided. The dip net can be raised or lowered by means of a rope attached to the hoop in a three-point suspension and running through a block at the end of the movable boom overhead. The contents are emptied by placing the hoop perpendicular to the opening of the hold and then raising the closed end of the net by reeling in on the rope attached to it, also running through an overhead block. The rope is reeled in by taking a turn or two on a small revolving drum. The advantage of the long bag dip net is the speed with which the bunched catch can be unloaded from the net. From 1500–3500 pounds at a dip, or at the rate of 60–80 tons per hour, can readily be loaded. Also the long bag dip net can be pushed deep enough so that the dead or weakened fish can be scooped up from the bottom of the net first.

A centrifugal suction pump for unloading of the catch from the net into the hold of the boat was given preliminary trials on the purse seine boat *Pal* during the latter part of the 1931–1932 season. The principle is the same as that involved in the suction pumping of the fish from the fishing boats to the canneries. However, the pump has not yet been perfected for use on boats, and its high cost at this time makes it prohibitive.

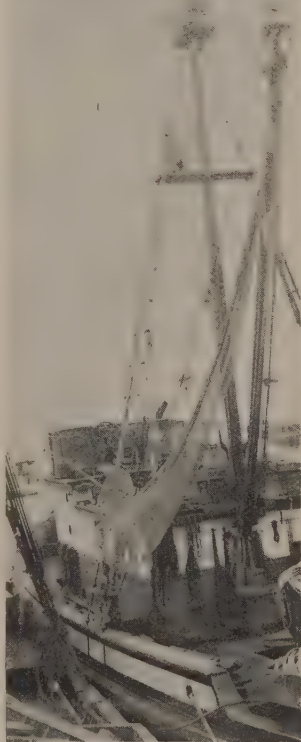


Fig. 93. A long bag dip net which is now part of the equipment of all purse seine boats in the Monterey region. The hoop or mouth is 4 feet across and the bag is 20 feet long. Note the long guiding handle lashed to the ladder. This dip net is only used for brailing or unloading the catch from the net. February, 1932.

CALIFORNIA FISH AND GAME

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Vol. 18

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No. 4

THE OUT-OF-DOORS

"A call from the open spaces, a call from the forests dim;
A call from the rushing rapids, from the partridge on the limb;
A call from the endless marshes and the driving flocks of ducks;
A call from the great white waters or a challenge from antlered bucks.

Sometime, somehow, it comes to us that vague, unreasoning want—
The ghost of the long ago returns our lives to haunt;
A voice of the time in the long ago when man hunted flesh for his life,
And fought and killed and ate and slept and lived in the forest's strife.

Those times are gone, and now we sit—bloated with other's kill—
But the call of God's own earth comes strong and we heed it as God's will.
We go to the open spaces, we go to the forests dim;
We go to the great white waters, we camp on the blue lake's rim.

We go to the endless marshes, we hunt the flocking ducks;
We fight with the rushing rapids, we answer the antlered bucks;
We go back to the ways of our fathers, we do as they did then;
We live the life God meant us to, we live the life of men."

—ERIC JORDAN.

IS CALIFORNIA'S GAME A REVENUE PRODUCING RESOURCE?

Beginning several days before the opening of the 1931 deer season and continuing for the full thirty-day period, the Sierra National Forest maintained 24-hour registration stations on all roads entering the forest. Under the Hazardous Fire Area law all hunters were requested to register both in and out of the forest, thereby making it possible to obtain practically a perfect record of the deer killed.

In all, 6145 hunters were registered, an average of 207 per day for the season and 1920 automobiles were used on the trip, each averaging 300 miles, or a total of 576,000 miles. Estimating that these cars would obtain 12 miles per gallon of gasoline, and an oil change each 1000 miles, 48,000 gallons of gasoline and 3000 quarts of oil were consumed—equal to 975 drums of gas and oil.

The total number of hunters, running 3.2 men per car, traveled 1,844,000 man miles by auto and 100,000 man miles on foot.

Estimating that each man shot 12 times on the trip, either at game or in testing his rifle, a total of 73,740 cartridges were used—equalling 3687 boxes or slightly over two tons of ammunition.

The records indicate that each man spent an average of 6.5 days on his hunting trip—a total of 39,942 man days—or 110 years for one man.

A total of 1400 deer were registered out—one deer to each 4.4 men—a much higher average than had been considered possible due to exceedingly dry weather and resultant noisy conditions in the woods. In 165 cases, hunters were able to secure their full quota of two bucks. The total number of deer was estimated at 100 pounds each—making 70 tons or 2 earloads of dressed venison. Contrary to previous incomplete records, and to common belief, 59 per cent of these deer were better than forked horns. The actual record follows:

2 points—574	3 points—393	4 points—308	5 points—98
6 points—14	7 points—6	8 points—6	9 points—2

In addition to the \$18,435 which we know was spent for hunting licenses and tags, it is estimated that each man spent an average of \$20 for the necessities of the trip. This indicates an expenditure of \$141,000 for 140,000 pounds of meat, or \$1 per pound for venison. All of which brings us to the conclusion that the harvesting of the annual deer crop has a potential value of \$100 per head. When it is considered that there is an annual kill of at least 20,000 deer in our California national forests, we have an expenditure of some \$2,000,000 each season that would not be spent if our deer crop failed through illegal hunting or destruction of their feed and habitat by fire. The beauty of the whole thing is that the money is spent in our own State, and affects practically every enterprise including gas stations, gunsmiths, cobblers, and shoe merchants, grocery stores, druggists, garages, mechanics, tire dealers, tobaccoists, sporting goods houses, magazine stands, guides and packers, hatters, clothing stores, etc., etc. Therefore it is excellent business for all—whether big game hunter, justice of peace, or cobbler—to assume a direct interest in game conservation and forest protection, always bearing in mind that breeding stock and young deer have an equal value with the legal buck.—ROY H. BLOOM, Sierra National Forest.

A CORRECTION

Attention wishes to be called to an error which appeared in the July, 1932 (Vol. 18, No. 3), issue of CALIFORNIA FISH AND GAME.

On page 275, Statement of Income reads "For the Period July 1, 1931, to June 30, 1932, of the Eighty-third Fiscal Year." This should read "For the Period July 1, 1931, to March 31, 1932, of the Eighty-third Fiscal Year."

THE HUNTER'S DAILY DOZEN DON'TS

1. DON'T point your gun, or let it point itself, at anyone, anytime, anywhere. Remember, it is always the empty gun that kills.

2. DON'T keep your gun loaded except when actually hunting. In camp and when others are around keep the bolt open.

3. DON'T shoot at any game until you are *sure* and *know* that your partner is not in the line of fire.

4. DON'T ever handle your gun by the muzzle. It is bad enough to have a fool at the other end.

5. DON'T fail to unload your gun when climbing fences or where there is dangerous footing.

6. DON'T go buck hunting without wearing a red hat. It might save you, for it is unlawful to shoot woodpeckers.

7. DON'T fire a gun unless you are *positive* that the gun barrel is clear of all obstructions.

8. DON'T go hunting without first having bought a hunting license. The game warden never sleeps, would pinch his own mother, and is a darn fine fellow—if you are.

9. DON'T lean on the muzzle of a gun or rest it on your foot. You won't look so nice mutilated.

10. DON'T neglect to clean and oil your gun as soon as possible after firing. A gun's efficiency is 99 per cent in the rifling. Once rusted the gun is ruined.

11. DON'T shoot harmless creatures just to see them die, or game that you can not use or pack to camp. It is always unlawful. The greatest charm of the forest is its wild life. Be decent. Treat all forest animals and game as though they were your own private property.

12. DON'T trust a "safety." It isn't always safe. A gun in your hands is a death sentence if your vigilance slackens for a moment. Be careful and in addition to that *be careful!*

HUNTING ACCIDENTS, 1931

Number of persons killed.....	60
Number of persons wounded, not killed.....	119
Number of self-inflicted accidents—	
Fatal	34
Nonfatal	64
Number of accidents inflicted by others —	
Fatal	15
Nonfatal	49
Number of accidents, unknown how inflicted—	
Fatal	11
Nonfatal	6
Occurred while hunting large game (deer, bear, etc.)—	
Fatal	23
Nonfatal	36
Occurred while hunting small game (rabbits, duck, quail, etc.)—	
Fatal	16
Nonfatal	55
Occurred while hunting unknown game—	
Fatal	21
Nonfatal	28



Fig. 94. Small fishing launches at Monterey beached for hull scraping. Photo by J. B. Phillips, June, 1932.

FISHERMEN REPAIR THEIR OWN BOATS

Commercial fishermen are also hard pressed during the present period of business dullness. An evidence of this is shown in the accompanying photograph of a few jig boats drawn up on the beach at Monterey for hull scraping. Periodic scraping and painting of hulls are necessary because of the accumulation of algae and barnacles. In this case the fishermen have taken advantage of the high daytime tides during calm weather to beach their craft. They can then work on their boats during low tide or for about five or six hours until the next high tide comes in, when the boats can be floated off the beach. During good times the commercial fisherman considers his time more valuable and will make use of the boat yard ways at about \$5 a trip. The larger sardine or net boats can not be beached in this manner because of their weight.—J. B. PHILLIPS.

LIFE HISTORY NOTES

DEER FEED AND ITS RELATION TO HUNTING

The last few weeks of the deer season have brought to light an interesting coincidence in regard to the failure or success of the hunter in getting his limit.

Deer, like all animals, wild or domestic, have well known preferences for certain herbaceous and browse plants at definite seasons of the year; and food, or the lack of it, is one of the chief factors responsible for their movements. Water, while equally necessary, may not always be of such importance, deer being able to travel a considerable distance for it.

Information gathered from various sources shows that two zones within the Kings River Canyon district on the Sequoia National Forest, differing widely in elevation, have given the best results.

In the Goat Mountain-Wildman country at an elevation of 8000-8500 feet, several parties report good hunting, and in most cases have an average of success of about 60 per cent. Hunters scouring the White Deer-Sampson country, of 2500-3500 feet, appear to have been equally successful. Those who covered the more open flats or plateaus in the yellow pine-fir type around the 5000-7000 foot elevation, have not averaged better than 10 to 15 per cent.

These reports concur with the estimates of forage conditions for both deer and domestic stock using the range. The "successful areas" offer a good assortment of forage during September and early October, and would indicate that deer, instead of being "where you find 'em," are where the feed is.

I have seen numbers of hunters in the vicinity of Big Meadows and Redwood Canyon, carefully working their way through types of country that even a self-respecting goat would hesitate to live in. It would seem strange that a deer would choose a densely timbered area to hide in, with little chance of cover or feed, when there are acres and acres of likely bed-grounds with plenty of food and from which a good view could be obtained, close by.

Distribution of animal life, wild or domestic, is primarily dependent on food. Acres of chinquapin (*Castanopsis sempervirens*) or manzanita, may provide cover but you will find the deer on the edge of these types and not in the middle. Variation of palatable forage plays an important part in the deer's bill of fare, and they are more likely to be found where there is an intermingling of vegetative types, and consequently a larger variety of forage, than in large areas of similar type and character.

The two "successful" areas seem to fill these requirements. Both offer a good assortment of feed, and water is not scarce. The feed-types in the high country while comparatively small, are interspersed with those containing little feed but ample cover. Those of the lower country, while larger and containing a high percentage of dried forage and browse (especially oak), are in many places overlapping.



Fig. 95. Deposit of two tides; one is a thin line in the picture near the top.
Photo by Theodore Hoover.

The deer from the highlands were in excellent condition, plenty of fat, and the hide quite blue; those from the lowlands were in good shape, but not completely shed off.—C. S. ROBINSON, Junior Range Examiner, Sequoia National Forest.

CRABS

On Thursday, June 23, 1932, there was a remarkable display of crab carapaces and legs on the Waddell Beach in the northeast corner of Santa Cruz County. This consisted of empty carapaces and detached legs, in the main, although along the high tide line there were considerable numbers of carcasses with legs attached, the internal body parts being missing. From the appearance of high and low tide distri-

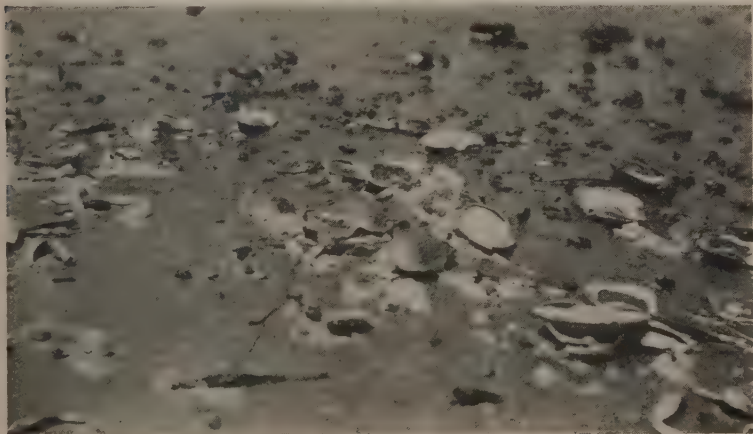


Fig. 96. Deposit of tides. Photo by Theodore Hoover.

bution of these parts it is inferred that the main deposit was made probably one or two days before the date of observation. Two typical ten-foot cross-sections of the beach were measured off and the carapaces counted. In one there was 103 and in the other 125; if we say that the average was 10 to the foot this would give over 50,000 to the mile and the deposit extended for at least two miles by actual observation. They were all about the same size, from six to seven inches across the carapace. Specimens were sent to Professor Harold Heath at the Hopkins Marine Station at Pacific Grove and were commented on by him as follows:

"The crabs have just arrived, and all prove to be *Cancer magister*, the edible crab of the markets. Also, all prove to be molted shells, so that it would appear that, possibly coming into shallow water from deeper levels, they molted and their cast off shells washed in. MacGinitie here is especially interested in the enormous numbers you report, and to all of us it is a revelation—no one has suspected that this species exists in such abundance, and I am surprised that commercial companies have not exploited the region before this. The crabs are of market size and with conservation measures the fishing for these animals may mean much to the people of the State."

On July 2d there was another tide which brought in about as many more.

The illustrations show about the average of the two miles.—THEODORE J. HOOVER.

PHEASANTS LAY EGGS IN CLOSE CONFINEMENT

In an experiment employing twelve female Chinese ring-neck pheasants (one to two years old) retained in very close confinement, it was observed that some birds would lay. The birds were placed in individual cages (28" x 24" x 24" in size) on March 22, 1932. They were fed scratch grain (cracked corn and wheat), chicken laying mash,



Fig. 97. Deposit of tides. Photo by Theodore Hoover.



Fig. 98. Pelican killed July 26, 1932. Contents of pouch, 53 fish—7 black bass, 9" in length; 1 hardhead, 12" in length; 6 bluegills, 3" length; 5 calico bass, 4" length; 34 carp, about 6" length. Photo by George Neale.

grit, and water. Cod liver oil was given weekly in the scratch grain. After April 7 all birds were handled at least once a week and some were handled more often.

The first egg was laid on April 18 and on May 21 nine pheasants were in production. The remaining three did not attain production during a period of approximately four months. At the end of this period they were necropsied. In two the ovaries were dormant and in the third the abdominal cavity was impacted with desiccated yolk material. The largest number of eggs laid by one pheasant was 38. This number of eggs was laid between April 20 and July 10. A total of 171 eggs were laid during a period of approximately four months by nine pheasants. At the end of this period they were necropsied and all but three had active ovaries. It was observed that a few pheasants had developed the habit of egg-eating; therefore, it may be possible that some eggs were destroyed, without being recorded. One bird laid a small sized egg ($1\frac{1}{2}$ cm. in diameter) which contained an undeveloped yolk (approximately 3 mm. in diameter).

These observations may be of interest to game fanciers and breeders, since it has been reported that pheasants will not lay eggs under conditions so remote from nature.—H. VAN ROEKEL, Department of Veterinary Science, Massachusetts Agricultural Experiment Station.

THE WHITE PELICAN

Of all the predatory birds and animals that prey upon fish life the white pelican is the worst of all. Mr. Pelican is strictly aquatic. He feeds entirely in fresh water, he likes his fish fresh, and he likes them alive. He is the most efficient fisherman extant, one pelican can, and does eat more fish per day than would supply a large family, he is not particular as to size, he can swallow a five-pound fish as easily as a five-inch one.

His pouch and maw will hold several pounds of fish which he will carry to the nesting grounds to his one, two or three babies and regurgitate the contents of his maw into theirs.

One of the most disgusting and foul smelling sights to be seen is a visit to the rookery or nesting grounds of these birds.

They select the so-called nest in the open barren ground, preferably in holes in the bedrock, there is no semblance of a nest, just a hole with one or two sticks to keep the eggs from rolling out of the cavity.

As soon as the sun appears, they leave the nest and let the sun do the rest, after hatching occurs and during the first few days the youngsters make a marvelous growth and keep their parents busy supplying them with partly digested and disgusting fish food.

On Lone Tree Island, five miles above the city of Sacramento and before reclamation, but now known as the Natomas Farms Company, with its wonderful orchards, the writer has seen many thousands of these birds, the pictures show but one of the groups in a small area, but there were twelve miles of them, when he took the pictures.

Since the reclamation of these wonderful farming lands, made so by overflows from both the Sacramento and Feather rivers, and the wild water fowl which wintered there, these birds have sought other places in which to nest, their natural home and habitat is Pyramid Lake in the State of Nevada.

Unlike the sea pelican, their brown relative, they do not dive from the air to take their food on the water. A long line of from thirty to fifty of these white birds will maneuver high above the water taking their bearings like a company of soldiers, then dropping down suddenly well out from shore, will line up in a new moon curve and each bird thrashing his wings on the surface thus driving the fish to the shore where the feast begins.

They live upon live fish, frogs and other aquatic beings. When the pelicans beat the fish rescue crew to a pond where thousands of fish,



Fig. 99. Pelican nesting grounds.



Fig. 100. Pelican nesting grounds.

and mostly game fish too, were yesterday, well it's too bad, for they can clean it out as clean as we can with nets.

The Bureau of Fish Rescue endeavor to locate the birds and where they are working and head them off before they get in their deadly work. We kill a great many of them, but it is of little use driving them to some other feeding grounds, they are just now, August, returning from the nesting grounds and raising havoc with the game fish, although they are not in the least particular as to specie, catfish or carp are just a delicacy to them.

An examination of the pouch and stomach content will give an idea of the number of fish consumed by them, and which is but about 50 per cent of the amount required to feed their young at nesting time.

An examination of three of seventeen killed on July 24th just coming from feeding showed:

Number 1. Three hardheads and nine carp of about one pound each;

Number 2. Five black bass of $1\frac{1}{2}$ pounds each, four crappie and two carp 8 inches each;

Number 3. Fourteen small black bass, 4 inches each, ninety-two small forked catfish, 2 inches, five large pollywogs, two small frogs and two small blue gill sunfish.

July 26, 1932, nine pelicans were killed, one of which dropped in a field nearby regurgitated fifty-three fish of different species, mostly bass and crappie, as seen in the picture. All the pelicans were killed on the Cosumnes River overflow and from whence we rescue about 40 per cent of our fish.—GEORGE NEALE, Sacramento, California.

DIVISION ACTIVITIES

BUREAU OF COMMERCIAL FISHERIES

Sardine canners on the California coast, some 23 in number, appeared before the Division of Fish and Game Commissioners in July and asked that they be allowed to reduce more sardines to edible oil and meals than heretofore. As an emergency measure the Commission granted the canners permits, that aggregate some 130,000 tons for the season.

There was much wrangling among canners and fishermen as to prices to be paid the latter, but there seems to be every promise that this feature will be adjusted on a basis of about \$4.75 per ton.

A few canneries opened before September, but the most of them waited until later as up to September 1st there is a deficiency of oil in this species of fish.

While only two reduction ships are known to be preparing to go beyond the legal limit to gather sardines for reduction purposes it is rumored a third will be in the field. The *Lansing*, to be operated by a company made up of fishermen is about ready to put to sea from San Pedro, and take up a position off the Monterey coast.

The District Court of Appeal denied the plea of the Bayside Fish Flour Company to force the Division of Fish and Game to give them an unlimited permit.

Salmon trolling season closed on June 30 in the Monterey area after a poor season of three months. Fish were scarce and prices low. In the San Francisco district the season was extended one month, from August 15 to September 15 at the request of Governor James Rolph, Jr. Some salmon fishermen endeavored to retail their catches at the San Francisco wharves but the idea was unsuccessful. Prices dropped to as low as 4 cents per pound for cleaned and headed fish.

North of San Francisco to the Klamath the salmon catches were better. The cannery at Requa opened and after canning 1000 tons turned to selling their supply to fresh fish markets.

Anglers had plenty of good salmon and steelhead fishing at the mouth of the Klamath. At one time 180 boats and 50 men were seen fishing on the lagoon or from the shores.

Three canneries on the river were operated under the name of "Sportsmen" plants.

At San Diego and San Pedro the tuna turn in has been splendid, prices holding up fairly well.

A San Diego superior court judge decided the fishermen last season did not break their agreement on prices with the canneries and ordered those canneries that held out a third of the money due during the last half of the 1931 season to pay the money to the fishermen. One cannery is said to have held out \$90,000 pending the outcome of the suit.

Some apprehension was caused by the receipt of shipments of canned tuna from Japan. This tuna was offered for sale here for less than the expense of canning in California. However, despite the

excellency of the Japanese tuna, it is not expected it will prove a menace to local tuna canneries.

The shad season now closed on the Sacramento ended fairly good.

Rock cod and mackerel were running well on Monterey Bay, but owing to low price daily limits here held to 50 or 100 pounds.

In southern California hundreds of pounds of confiscated fish were turned over to public and charitable institutions, and letters were received from these thanking the Division of Fish and Game for their donations.

Two companies leasing kelp beds have cut down their harvesting to a new low level, the depression evidently being felt in this line of endeavor as in many others.

BUREAU OF HYDRAULICS

After months of controversy this bureau found it necessary to take the case of the Benbow Improvement Company into court to force action on the construction of a proper fish ladder at their dam on the Eel River. When a representative of the company appeared in the justice of the peace court he promised to rush the work and have the ladder completed for the run of steelhead.

Some major oil companies in the San Pedro district experienced considerable loss and were put to considerable effort to clear up the bay of oil, following breakage in their pipe lines. However they went at the work of cleaning up the waters and salvaging what oil they could in a manner that soon reestablished conditions to a normal basis.

Oil companies along the Santa Barbara coast have done everything to satisfactorily control the oil wastes from their wells and the ocean waters are free from pollution.

A survey and an inspection of water rights has been made of the Forest Home Hatchery properties recently taken over by the Division of Fish and Game.

BUREAU OF GAME REFUGES

The Buttonwillow Elk refuge in Kern County has been completed. The cost of the fencing was \$200 per mile less than estimated. Already the herd enclosed on the Miller-Lux ranch has been placed in this new range and work is starting on rounding up some 250 others that roam at large. Quail and cottontail rabbits have found the refuge a good place to go, and it appears this area will be an excellent place for these game birds and animals to increase under absolute protection.

Mountain lion hunters have showed great activity. To August 31, 240 scalps have been turned in, 66 above the average for the first 8 months of the past 20 years.

Wild ducks have nested more numerously on the refuges this year than for many years past, and never in the history of the Los Banos refuge has there been seen so many young ducks as this year.

Frank Booth of San Francisco donated to the Division of Fish and Game 260 domesticated wild gray mallards and 100 black mallards. These birds were raised on Winters Island, but the salt water was not conducive to their well being, and in the fresh waters of Gray, Los Banos and Gridley refuges it is expected they will show improvement.

These birds will be allowed to hatch their young under natural conditions, in large enclosures. The young will be banded as they are liberated.

The falling off of the number of deer killed in districts 2, 2½ and 3 checks with the decrease in the sales of hunting licenses. Deer were numerous throughout the three districts, and hunters had no difficulty in getting their bucks, and many got limits in short time.

BUREAU OF GAME FARMS

The hatching season has ended on the game farms, and the work of distributing young and strong young birds has commenced. Pheasant, valley quail, wild turkeys and guinea fowl are being placed in various sections of the State. Especially in northern California have wild turkeys been doing well, and more are being sent to selected regions.

Various cities throughout California have given wonderful cooperation in rearing pheasants, and especially has success crowned the efforts of sportsmen of Oroville, Etna, Redding, Chico, Fall River Mills, Lookout, Alturas and Bakersfield.

At Bakersfield the pens erected by fish and game associations and the county, were filled three times with young pheasants from Yountville which were held until 12 weeks old and then released in the county.

On one new quail refuge in southern California 200 quail have been released. These were properly banded so a check can be kept of the range of the birds. Hunters killing any quail with a fish and game band on its leg should send the band to the nearest branch of the Division of Fish and Game. Over 7000 acres of land has now been set aside for quail refuges in the south.

Attractive game bird exhibits were sent from the Yountville farm for fairs at Sebastapol, Stockton and Sacramento. The Chino Farm prepared a live bird exhibit for the Pomona Fair.

BUREAU OF FINANCE

With the fiscal year report completed, this department was kept very busy getting out the licenses and deer tags for the opening of the deer seasons, the first of which started August 1. It was noted there was a falling off in the sales of hunting licenses and deer tags for this year's deer season. The new metal tags seem to have been favorably accepted throughout the State by the hunters.

The 84th annual fiscal report shows a falling off in fines, and a decline in fish packers tax. Court fines have been collected quite promptly, and at the end of the year there was only \$8,000 outstanding. An effort, by this bureau in collecting the fines held by magistrates, has resulted in over \$2,000 being brought in during the past few months.

In the coastal area, first opened to deer hunting, the three offices of this bureau were kept busy issuing licenses and a brisk business was expected when the Sierra and southern California districts were thrown open on September 16.

A survey of the business done since July 1 in license sales indicate there will be quite a decrease in sales of all licenses this year.

BUREAU OF FISH CULTURE

The Division of Fish and Game took over the commercial hatchery of Henry Robbins, which the latter has operated in Forest Home, San Bernardino County during the past 16 years. This hatchery, fully equipped and with a supply of some 2,000,000 trout ranging from fingerlings to 12 inches, is situated at an elevation of some 6000 feet, and splendidly fitted out for hatching and raising trout.

Dr. S. H. Davis and Dr. Paul R. Needham of the U. S. Bureau of Fisheries made an inspection of the plant for the Fish and Game Commission and pronounced the fish in excellent condition.

To relieve the crowded rearing ponds the commission started the largest plant of matured trout that has ever been made in this State. Some 300,000 fish ranging from 6 to 12 inches are being liberated in streams and lakes of San Bernardino, Ventura, Los Angeles and Riverside counties. Anglers turned out in unprecedented numbers to catch these fish and any who had a pole and a license had no trouble in getting limits. In some instances grownups borrowed neighbor children to aid in augmenting the supply for the creels.

Checks were made of the number placed in each spot and further checks will be kept to see how many of the fish were fished out and how those not caught come through the winter. In some closed areas plants are being made to observe if the trout will spawn in mountain waters after being raised in a hatchery.

The experiment in graylings has proven a success. An inspection of Grayling Lake, in the Yosemite area was made and it was found the fish released two years ago have grown to from 12 to 14 inches. The presence of many young graylings in the stream below the lake indicate the graylings are increasing in their new environments.

The Friant plant for small mouth black bass is getting through the hot summer of the Fresno region in good order. The temperature of the water has been held low enough so the loss has been small.

There is plenty of food fish for the bass and it is expected the rearing ponds will produce many of this variety of game fish the coming season, and which will be planted in nontrout waters.

During the past three months the planting of trout throughout the State has gone on under the direction of this bureau, aided by the wardens and angler associations. Through the close cooperation existing between these and the railroad companies the loss of young trout during transportation has been negligible.

From present indications the plant of trout and salmon this year will reach the great total of over 56,000,000, of which some 18,000,000 are salmon.

BUREAU OF EDUCATION AND RESEARCH

The exhibit at the California State Fair, at Sacramento, which ran from September 3 to 10 was one of the outstanding groups at that exposition. In the County Building, an elaborate diorama was set up showing the fish and game resources of California from the deserts of the south to the redwood belt in the north. In the very center of this scene was a replica of Strawberry Creek on the American River Canyon, the waterfall pouring over into the hole in which there were many of our native fishes. In addition to this exhibit, the aquaria on

the outside of the exhibit contained representatives of all of the spiny-rayed fish to be found in California waters. This work was sponsored by the Bureau of Fish Rescue and Reclamation and attracted considerable attention.

In the Western States Building, an exposition of deer heads was sponsored. Prizes were offered by interested sportsmen and conservationists and the showing was a remarkable one. This was the first year that such a plan had been put in operation and it is expected that in future years this deer head competition will be one of the important works at the Fair.

A handbill covering the new waterfowl regulations as fixed by the U. S. Department of Agriculture was prepared and released for distribution.

Dr. M. Hobmaier worked out the control method of scabies infestation of tree squirrels in Marin County and has continued his investigation of duck sickness. A rather serious outbreak of lead poisoning among the ducks of the Suisun Marsh occupied much of his attention. Considerable time was spent securing material from that area, and it was found that what was first thought to be a recurrence of botulism was only lead poisoning due to the fact that the birds had picked up shot from the bottom of the ponds. These ponds have been shot over since the early 70s and there is a considerable quantity of shot on the bottom of the ponds.

BUREAU OF FISH RESCUE AND RECLAMATION

The recession of waters in the mountain streams during the summer months has called for much activity on the part of the bureau in rescuing fish left in pools formed by high waters earlier in the season.

In sloughs much work was done as the water levels lowered.

During July 625,462 fish were rescued, over 300,000 of these being catfish, and over 150,000 green sunfish.

August the catch was 322,581, with 265,054 catfish, 35,151 green sunfish and 11,294 striped bass.

BUREAU OF PATROL

During the past quarter the patrol and the cannery inspection activities, formerly conducted by the Bureau of Commercial Fisheries, were merged. Seventeen employees were affected, and this number added to the personnel of the Bureau of Patrol.

During July, 3,575,565 pounds of tuna were brought into San Pedro, being inspected by the men under this bureau. Some five tons of undersized tuna were confiscated and donated to the Los Angeles County hospital.

As a result of the close harmony existing between the deputies and the new men added from the cannery activities force, the patrol of the clam grounds about Pismo Beach are said to be the most effective for many years past.

The opening of the deer season caused added activities among the wardens, but for the most part the large army of hunters observed the law. The new metal tags seemed to give but little trouble, and deer were plentiful. Less than 30 arrests were made for violating game laws as affecting deer hunting.

Extra wardens were sent to Mono and Alpine counties to check up on reports of illegal trout fishing.

Many arrests were made around Pittsburg of anglers catching undersized striped bass.

Spotlight hunters in the San Francisco Game Refuge, including the Spring Valley watershed, received considerable attention and six arrests were made of hunters seeking deer with the aid of spotlights. Some sheep grazing under permit in that section, were also reported being killed.

State-owned automobiles that have seen two years service and with 35,000 or more miles behind them are being traded in on new cars. The new ones are of the closed cab type with pickup bodies.

The *Albacore* has been doing patrol work in and around San Luis Obispo. Arrests were made by the crew of the *Albacore* of men using illegal drag nets. The *Albacore* was later sent to Monterey to assist in a survey being made for tuna, and assisted in getting considerable valuable data relative to this commercial fish in that area.

The *Bluefin* has had wireless installed and is ready to roam the high seas in any direction.

VOLUNTEER DEPUTIES

Volunteer deputies, during the first six months of this year, checked 955 hunting licenses, 11,434 angling licenses and arrested or assisted in arresting 85 violators of fish and game laws, in which fines to the amount of \$2,305 were imposed.

In addition to assisting in establishing small game sanctuaries, they killed the following number of predators on small game: bob cats, 47; house cats, gone wild, 256; skunks, 351; coon, 13; coyotes, 13; other such animals, 29, and carnivorous birds, 826.

The force of volunteer deputies has been reduced from 500 to 325.

Reports from volunteer deputies indicate quail have increased materially during the past year, due in a measure to the posting of hundreds of acres set aside as a refuge for these birds.

REPORTS

STATEMENT OF INCOME JULY 1, 1931, TO JUNE 30, 1932

83d Fiscal Year

	Division of Fish and Game	County clerks	Total
Hunting, 1929.....		\$523 68	\$523 68
Hunting, 1931.....	\$237,509 00	161,865 90	399,374 90
Hunting, 1932.....	3,826 50	1,251 00	5,077 50
Angling, 1928.....		2,104 32	2,104 32
Angling, 1929.....		2,383 80	2,383 80
Angling, 1931.....	264,861 00	155,418 00	420,279 00
Angling, 1932.....	63,545 00	43,423 00	106,968 00
Deer tags, 1931.....	69,360 00	59,645 00	129,005 00
Deer tag, 1932.....	1 00		1 00
Market, 1931-32.....	29,290 00		29,290 00
Market, 1932-33.....	25,950 00		25,950 00
Trapping, 1931-32.....	2,858 00		2,858 00
Game breeders, 1931.....	130 00		130 00
Game breeders, 1932.....	877 50		877 50
Fish breeders, 1931.....	85 00		85 00
Fish breeders, 1932.....	445 00		445 00
Fish importers, 1931.....	15 00		15 00
Fish importers, 1932.....	95 00		95 00
Wholesale fish packers, etc., 1931-32.....	1,285 00		1,285 00
Commercial hunting club, 1931-32.....	1,375 00		1,375 00
Commercial hunting club operators, 1931-32.....	345 00		345 00
Kelp, 1931.....	10 00		10 00
Total license sales.....	\$701,863 00	\$426,614 70	\$1,128,477 70
		Judges	
Kelp tax.....	\$90 22		\$90 22
Fish tag sales.....	3,023 10		3,023 10
Fish packers' tax.....	84,446 17		84,446 17
Interest.....	5,437 94		5,437 94
Game tag sales.....	145 98		145 98
Importers' contributions.....	45 00		45 00
Miscellaneous sales.....	728 10		728 10
Court fines.....	54,498 19		54,498 19
Lease kelp beds.....	1,256 40		1,256 40
Total other income.....	\$149,671 10		\$149,671 10
Total income.....	\$851,534 10	\$426,614 70	\$1,278,148 80

STATEMENT OF EXPENDITURES

For the Period July 1, 1931, to June 30, 1932, of the Eighty-third Fiscal Year

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Administration:					
Executive.....	\$9,000 00				\$9,000 00
Clerical and office.....	21,961 23	\$2,637 11	\$463 23	\$735 61	25,817 18
Printing.....		21,008 75			21,008 75
Automobiles.....		296 65	339 29	15 10	651 04
Traveling.....			4,242 46		4,242 46
Postage.....			5,905 83		5,905 83
Telephone and telegraph.....			4,483 93		4,483 93
Freight, cartage and express.....			3,169 17		3,169 17
Rent.....			15,608 83		15,608 83
Accident and death claims.....			3,580 16		3,580 16
Accounting pro rata.....	4,500 00				4,500 00
Legal.....	6,600 00		625 52	264 51	7,491 03
Premiums on bonds.....			87 50		87 50
Publicity.....			505 54		505 54
Total administration.....	\$42,061 23	\$23,962 51	\$39,012 46	\$1,015 22	\$106,051 42
Education and research:					
Chief and assistants.....	\$6,487 94				\$6,487 94
Clerical and office.....	2,442 05	\$191 55	\$328 73	\$26 70	2,989 03
Automobiles.....		3 05	4 50		7 55
Traveling.....			6,557 80		6,557 80
Telephone and telegraph.....			28 88		28 88
Freight, cartage and express.....			8 66		8 66
Photographer.....	1,440 00		252 54	1,510 46	3,203 00
Librarian.....	2,007 10	230 93	123 50	246 55	2,608 08
Research.....	10,871 62	388 26	3 57	33 67	11,297 12
Blue printing.....			12 66		12 66
Publicity.....			528 67		528 67
Exhibits.....			8 25		8 25
Lecturer.....	3,780 00				3,780 00
Temporary help.....	77 63				77 63
Total education and research.....	\$27,106 34	\$813 79	\$7,857 76	\$1,817 38	\$37,595 27
Patrol and law enforcement:					
Chief and assistants.....	\$11,070 00				\$11,070 00
Clerical and office.....	3,210 32	\$143 42	\$91 96	\$108 47	3,554 17
Automobiles.....		10,093 24	4,812 65	17,226 11	32,132 00
Traveling.....			126,852 91		126,852 91
Postage.....			431 96		431 96
Telephone and telegraph.....			1,984 66		1,984 66
Freight, cartage and express.....			64 93		64 93
Rent.....			565 99		565 99
Heat, light and power.....			25 94		25 94
Captains and deputies.....	206,713 15	1,860 66	466 76	414 92	209,455 49
Launches.....		2,548 28	1,486 33	175 69	4,210 30
Fish planting.....	6,077 72	644 23	278 63	110 00	7,110 58
Volunteer deputies.....	435 00				435 00
Premiums on bonds.....			2,570 78		2,570 78
Temporary help.....	30 00				30 00
Cooks.....	1,911 29				1,911 29
Total patrol and law enforcement.....	\$229,447 48	\$15,289 83	\$139,633 50	\$18,035 19	\$402,406 00
Commercial fisheries:					
Chief and assistants.....	\$16,170 00			\$41 00	\$16,211 00
Clerical and office.....	10,364 72	\$242 63	\$117 27	82 57	10,807 19
Automobiles.....		787 11	281 42	497 00	1,565 53
Traveling.....			21,102 60		21,102 60
Postage.....			3 52		3 52
Telephone and telegraph.....			657 07		657 07
Freight, cartage and express.....			596 87		596 87
Rent.....			1,164 94		1,164 94
Heat, light and power.....			425 33		425 33
Research.....	8,113 47	206 10		93 60	8,413 17
Captains and deputies.....	16,530 00	142 43	109 92	13 30	16,795 65
Launches.....	12,515 00	5,308 77	2,805 62	538 25	21,167 64
Laboratory.....	30,748 58	857 33	1,470 69	798 41	33,875 01
Blue printing.....			5 94		5 94
Fish tags.....		170 00			170 00
Hydro-biological survey - Monterey Bay.....			1,500 00		1,500 00
Statistics.....		1,023 53	1,953 67	48 15	3,025 35
Fish cannery research.....			15,000 00		15,000 00
Fish cannery inspectors—seasonal.....	15,040 55				15,040 55
Total commercial fisheries.....	\$109,482 32	\$8,737 90	\$47,194 86	\$2,112 28	\$167,527 36

STATEMENT OF EXPENDITURES

For the Period July 1, 1931, to June 30, 1932, of the Eighty-third Fiscal Year—Continued

Function	Salaries and wages	Materials and supplies	Service and expense	Property and equipment	Total
Fish culture:					
Chief and assistants	\$9,700 00			\$42 80	\$9,742 80
Clerical and office	4,119 67	\$192 68	\$35 20	93 35	4,440 90
Automobiles		5,951 01	2,684 17	3,862 06	12,497 24
Traveling			12,147 26		12,147 26
Postage			110 57		110 57
Telephone and telegraph			1,204 00		1,204 00
Freight, cartage and express			1,279 19		1,279 19
Rent			1,549 84		1,549 84
Heat, light and power			1,388 81		1,388 81
Hatcheries	113,347 16	67,947 38	1,862 05	2,607 31	185,763 90
Special field investigations	9,735 66	178 88	20 19	7 25	9,941 98
Fish cars	3,540 00	427 60	2,559 74	19 61	6,546 95
Blue printing		9 24	40 91		50 15
Cooperative research	1,856 45	85 43	909 18	310 25	3,161 31
Fish hatchery assistant—seasonal	29,490 46				29,490 46
Total fish culture	\$171,789 40	\$74,792 22	\$25,791 11	\$6,942 63	\$279,315 36
Hydraulics:					
Chief and assistants	\$8,340 00		\$50 66	\$41 00	\$8,431 66
Clerical and office		\$23 82	47 54		71 36
Automobiles		449 04	271 27		720 31
Traveling			2,261 26		2,261 26
Postage			1 00		1 00
Telephone and telegraph			8 25		8 25
Cooperative research	3,000 00				3,000 00
Total hydraulics	\$11,340 00	\$472 86	\$2,639 98	\$41 00	\$14,493 84
Game propagation:					
Superintendents	\$3,300 00				\$3,300 00
Clerical and office	90 00				90 00
Automobiles		\$473 60	\$136 05	\$537 72	1,147 37
Traveling			2,379 99		2,379 99
Postage			19 60		19 60
Telephone and telegraph			268 98		268 98
Freight, cartage and express			63 68		63 68
Heat, light and power			1,030 02		1,030 02
Maintenance		10,560 08	1,233 26	4,209 56	16,002 90
Assistants	14,297 57				14,297 57
Total game propagation	\$17,687 57	\$11,033 68	\$5,131 58	\$4,747 28	\$38,600 11
Fish rescue:					
Chief and assistants	\$5,034 00	\$14 94	\$198 62	\$68 00	\$5,315 56
Traveling			2,188 47		2,188 47
Rent			210 00		210 00
Total fish rescue	\$5,034 00	\$14 94	\$2,597 09	\$68 00	\$7,714 03
Game refuge:					
Chief and assistants	\$8,645 00				\$8,645 00
Clerical and office	1,920 00	\$32 89	\$4 00		1,956 89
Automobiles		1,038 18	299 29		1,337 47
Traveling			4,654 78		4,654 78
Postage			1 97		1 97
Telephone and telegraph			21 35		21 35
Freight, cartage and express			50		50
Lion hunters and trappers	7,466 59				7,466 59
Refuge posting		122 91	252 60	\$863 04	1,238 55
Predatory animal control			7,970 00		7,970 00
Temporary help	16,497 29				16,497 29
Refuge maintenance	5,306 00	4,441 98	4,816 77	6,429 60	21,493 75
Pump and pump shelter				3,916 13	3,916 13
Total game refuge	\$40,334 88	\$5,635 96	\$18,021 26	\$11,208 17	\$75,200 27
Additions and betterments—construction Russian River jetties (Payable from Support—83d F. Y. Chap. 183-31)					\$48 02
Additions and betterments—opening Salinas River channel (Payable from Support—83d F. Y. Chap. 183-31)					42 50

STATEMENT OF EXPENDITURES

For the Period July 1, 1931, to June 30, 1932, of the Eighty-third Fiscal Year—Continued

Function	Property and equipment	Total
Construction, improvements and equipment:		
Telephone and power line from Chester to Lake Almanor Fish Hatchery	\$2,400 00	
Improvements at Lake Almanor Hatchery	1,391 35	
Bass ponds	4,013 89	
Filter at Big Creek Hatchery	141 85	
Permanent repairs on Brookdale Hatchery	761 30	
Construction of dams on Cherry Creek	1,000 00	
Completion of egg-collecting racks at Chester	728 66	
Construction of rearing ponds and a temporary house for an attendant, Hat Creek, Inyo County	1,245 18	
Tank and egg collecting station at Huntington Lake	2,355 38	
Filter at Kaweah Hatchery	488 86	
Klamathon Station—Station House and Dry Room Project	274 73	
Klamathon Station—Warehouse Project	215 07	
Repairs and improvements at Mount Shasta Hatchery	1,525 94	
Maintenance and improvements—Navarro River jetty	459 50	
Opening Salinas River channel	70 64	
Permanent improvements on Snow Creek Hatchery	1,233 12	
Total construction, improvements and equipment		\$18,305 47
Expenditures to pay claim of Electro Metals Company		\$18,750 00
Expenditures to pay claim of John H. Hellard, B. J. Humphreys, Kimball Upson Co., and Moore Mercantile Co.		215 81
License commissions		48,252 82
Protecting construction of Russian River jetties payable from Chapter 60-1931		15,298 80
Purchase of game refuges		120,885 05
State Fair and other exhibits		4,946 10
Prior year expense—82d fiscal year		14,496 10
Grand total proprietary group		\$1,370,144 33

NOTE.—\$9,376.91 was transferred from Fish and Game Preservation Fund only to the State Employees' Retirement Fund.

SEIZURES OF FISH AND GAME

April, May, June, 1932

Fish:		
Abalones	.....	1,184
Bass—		
Black	.....	15
Striped, pounds	.....	488
White sea, pounds	.....	516
Barracuda, pounds	.....	4,073
Crappie and perch	.....	268
Crabs	.....	232
Clams	.....	1,167
Catfish, pounds	.....	162
Cockles, pounds	.....	500
Halibut, pounds	.....	24
Lobsters, pounds	.....	210
Miscellaneous fish, pounds	.....	105
Mussels, pounds	.....	200
Steelhead, pounds	.....	260
Shad, pounds	.....	170
Trout, pounds	.....	409
Tuna—		
Bluefin, pounds	.....	56,093
Yellowfin, pounds	.....	1,337
Traps, lobster	.....	12
Game:		
Deer	.....	4
Deer meat, pounds	.....	369
Doves	.....	20
Ducks, geese	.....	17
Grouse	.....	1
Pheasants	.....	4
Quail	.....	2
Rabbits	.....	5
Squirrels	.....	10
Shorebird	.....	1
Sagehens	.....	4

FISH CASES

April, May, June, 1932

	Number arrests	Fines imposed	Jail sentences (days)
Angling License Act; violations of	88	\$1,248 00	79
Abalones; overlimit; small	82	1,320 00	30
Barracuda; small	2	25 00	2½
Bass—			
Black; closed season; small	5	80 00	
Striped; small	19	350 00	
White sea	1	25 00	
Clams; overlimit; small; closed district	49	535 00	245
Cockles; small	7	25 00	30
Crappie; perch; sunfish; closed season	9	100 00	4
Catfish; selling small	4	20 00	
Crabs; small	17	215 00	100
Commercial Fishing License Act; violations of	43	190 00	22½
Lobsters; closed season	1	000 00	
Mussels; overlimit	7	35 00	6
Nets; seines; illegal use of	8	258 00	242
Spear; too near stream	5	27 50	
Shad; closed season	1	000 00	
Trout; closed season	52	596 00	86
Tuna; selling overweight of	3	25 00	
Traps; lobster	4	60 00	
Fishing with several lines; fishing near dam	6	40 00	
Taking marine life within the Hopkins Marine Life Refuge	1	5 00	
Totals	414	\$5,179 50	847

GAME CASES

April, May, June, 1932

	Number arrests	Fines imposed	Jail sentences (days)
Deer; closed season	38	\$610 00	522½
Ducks; geese; closed season	12	150 00	50
Doves; closed season	5	75 00	
Grouse; closed season	1	25 00	
Hunting License Act; violations of	4	95 00	
Hunting in refuge	4	20 00	
Non-game birds; killing of	8	00 00	40
Pigeons; closed season	2	50 00	
Pheasants; closed season	6	398 00	1
Pollution of streams	2	215 00	
Quail; closed season	4	100 00	25
Rabbits; closed season	7	50 00	
Sagehen; closed season	2	50 00	
Spotlight hunting	4	25 00	90
Squirrel, tree; killing of	1	25 00	
Trapping License Act; violations of	1	10 00	
Totals	101	\$1,898 00	728½

Shad.....	1,375		57,917	39,795	861,941	82,701	1,040	
Shark.....						1,480		
Sheepshead.....	13,750					1,825	8,030	2,988
Skate.....								
Skipjack.....					2,397		21,481	18,419
Smelt.....	4,986	866					80	
Snout-lack.....	578							
Sole.....	2,275,444	6,110					187,739	21,689
Spittail.....		3,500						
Striped Bass.....			9,381	29,842	509			
Sucker.....		4,950			117,945	1,972		
Swordfish—Broadbill.....								
Swordfish—Madrin.....								
Tom Cod.....	140					20		
Tuna—Bluefin.....								
Tuna—Yellowfin.....								
Turbot.....		1,034						
Whitebait.....	35,774	8,803				4,232	183	7,373
Whitefish.....								
Yellowtail.....								
Miscellaneous.....	34,857	2,000		178	156	20	494	25
Total fish.....	4,154,719	516,371	105,671	261,786	1,189,116	1,157,471	666,882	1,017,636
Crustaceans:								
Crab.....	39,738	1,812					424	462
Shrimp.....					180,508			3
Spiny Lobster.....		139,857						
Mollusks:								
Abalone.....		26						861,375
Clam—Hard-shell.....		357						
Clam—Mixed.....		651		46,202		320		
Clam—Pismo.....	3,163						309	1,304
Clam—Soft-shell.....		241		27,802	5,635	3,134		
Mussel.....	180							
Octopus.....		401						
Oyster—Eastern.....				14,608		505	465	7,778
Oyster—Native.....				2,525		25,437		
Squid.....						21,545		
Totals.....	4,197,800	519,859	105,671	249,780	1,375,259	2,201,365	676,065	5,393,188

All amounts shown in pounds unless otherwise specified. Skipjack cleaned.

CALIFORNIA FRESH FISHERY PRODUCTS FOR THE MONTHS OF APRIL, MAY AND JUNE, 1932—Continued

Compiled by Division of Fish and Game, Bureau of Commercial Fisheries

Species of fish	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego, Imperial	Total	Fish from south of the International Boundary brought into San Pedro.	Fish from south of the International Boundary brought into San Diego.	Total fish from south of the International Boundary brought into California
Anchovy	3,096	21,589	31,611	210,808	152,859	52,736	8,266	61,002
Barracuda	61	983,781	1,499	311,291	1,234,866	1,210	1,210	1,210
Bonito		157,408		786	470,259		52,078	88,636
Cabrilla		10,550			786			
Carp					30,380			
Catfish					30,149			
Catfish	23	80	56		235,246			
Cutts	15	479	23		107,594			
Floater		27,484			27,484			
Flying fish					6,723			
Hake		3,641	17	417	3,475			
Halibut		83,011	13,117	18,019	200,907			
Halibut—California	75,218				269,976			
Halibut—Northern					275,003			
Hardhead					3,311			
Herring					1,915			
Kelp Bass	1,120	795			106,439			
Kingfish	70	69,049	224	452	120,832			
Mackerel—Horse	69	85,486			3,205,108			
Mackerel—Pacific	1,255	2,941,202	15,317	59,684	6,672			
Mullet		1,398		5,274	36,735			
Perch	199	21,753	37		423			
Pike					3,205			
Pompano		3,140	9		890	3,728		3,728
Ray		490		60	340			
Rock Bass	500	53,042	2,255	56,080	111,947	587		587
Rockfish	20,273	434,633	19,226	160,498	1,476,856	4,567		4,567
Sablefish	88	23,262	362		308,674			
Shad		16			1,407,146			
Sand Dab		1,512	20		159,402			
Sardine		32,151	140	524,466	1,598,399			
Sea Bream	20	22,059	301	1,923	25,917			
Sea Bream	836	22,059	3,428	24,892	32,746			
Sea Bass	9,800	45,818	973	12,419	70,162	23,774	16,296	39,070
Sea Bass							55	55

Shad	88,360	87,835	29,343	1,042,354			
Shark	6,738	22	116	8,371	41		
Sheepshead	1,495	247	62	32,924			
Skate	6,222						
Skipjack					1,430,869	3,583,070	5,013,939
Smelt	10,055	225	7,184	207,955			
Smelt-Jack	1,805	311	77	3,270			
Sole	39,365			2,564,236			
Solifail				6,072			
Striped Bass				150,140			
Sucker				4,950			
Swordfish—Broadbill	54,215	6,252	23,143	83,610	977	1,648	2,625
Swordfish—Marlin	478		187	665		285	285
Tom Cod				160			
Tuna—Bluefin	33		13,542	221,874	205,292	2,992	208,284
Tuna—Yellowfin			53	53	7,852,422	6,364,538	14,216,960
Turbot				1,034			
Whitebait				58,449			
Whitefish	11,954		12,605	24,559	489	1,143	1,632
Yellowtail	297,933	5,188	99,153	402,274	134,056	36,368	170,424
Miscellaneous	10,191	192	2,760	51,065	2,469	2,390	4,859
Total fish	169,860	189,227	1,575,234	16,809,594	9,742,098	10,074,906	19,817,904
Crustaceans:							
Crab				704,632			
Shrimp				651,125			
Spiny Lobster					3,132		3,132
Mollusks:							
Abalone	255,535			1,116,936			
Clam—Hardshell				54,839			
Clam—Mixed	8,280			6,518			
Clam—Pismo	2,384			21,782			
Clam—Softshell	20,169			36,812			
Mussel				180			
Octopus				9,149			
Oyster—Eastern				40,045			
Oyster—Native				24,070			
Squid				3,512,985			
Totals	445,564	189,227	1,575,234	22,988,667	9,746,130	10,074,906	19,821,036

All amounts shown in pounds unless otherwise specified. Skipjack cleaned.

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ABSTRACT

CALIFORNIA SPORTING FISH AND GAME LAWS

VALID UNTIL 90 DAYS AFTER CLOSE OF 1933 LEGISLATURE

1931 OPEN AND CLOSED SEASONS 1932

WHITE SQUARES INDICATE OPEN SEASON. NUMBERS IN SQUARES ARE OPEN DATES

GAME		DISTRICTS	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	BAG AND POSSESSION LIMITS, ETC.
DEER	1½											15			No Does, Fawns or Spike Bucks No Forked Horned Deer in Dist. 14 No sale of Venison or Deer Skins Two Bucks per Season except in 1½ where limit is one See Notes 6-9-10-12
	2-2½-3											14			
	1-1½-4-4½-4¾-23 24-28											16	15		
Rabbits—Cottontail and Brush		ALL EXCEPT 4¾											15	15	15 per day. 30 per week. No limit in District 4 No protection in 4¾
Bear, Fur Animals		ALL											15		See Note 7 Predatory animals ungranted in districts 2-2½-3-4-4½
Ducks, Geese, Jack Snipe, Mud Hens		FEDERAL LAW ALL STATE LAW													15 Ducks, 30 in Possession; 4 Geese, 8 in Possession; 20 Snipe, 25 Mud Hens, No Ross Snow or Cackling Geese 25 Ducks, 25 Snipe, 25 Mud Hens, 50 Per Week Goose Limit See Note 4. See Notes 9-10-11-12-13
Quail—Valley, Desert and Mountain		ALL EXCEPT 1½ 1½											15	15	Valley and Desert 15 per day. 30 per week Mountain 10 per day. 20 per week
Dove		ALL EXCEPT 4-4½-4¾ 4-4½-4¾													Federal Season Open: Russ September 1 15 per day 30 per week
There is no open season on Elk, Antelope, Mountain Sheep, Sea Otter, Tree Squirrel, Sierra Hare, Rail, Wood Duck, Pigeon, Swan, Shore Birds (except Jack Snipe), Grouse, Sage Hen, Imported Quail, Wild Pheasant, Partridge, or Wild Turkey.															
FISH		DISTRICTS	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	BAG AND POSSESSION LIMITS, ETC.
Steelhead and all Trout (except Golden), Whitefish	1-1½-1¾-2-2½-4-4½-4¾-15 Klamath River, Lake Almanor														No Sale No Sparring For other restrictions See Notes 12-15-16-20 21-22-28-29 31-33 On this Card
	2½		28			30									
	23-24-25					30									
	Truckee River					15									
Unlawful to take trout in waters closed by Gov- ernor's proclamation		See Note 22													
		1½ Winter Klamath River													5 Trout regardless of weight
		Russian, Navarro, Napa and Tol (Dist. 2) Edgewater Dists. 2-3-15													3 Trout regardless of weight
Golden Trout		ALL													20 per day. None under 5 inches Not more than 10 lbs. and one
BLACK BASS		ALL EXCEPT 4¾ CLEAR LAKE IN LAKE CO.													15 per day No (and Snipe) in 4¾ Clear Lake 10 per day
Sunfish		ALL													No Black Bass under 9 ins. No sale Hook and line only
Sacramento Perch and Crappie		ALL EXCEPT CLEAR LAKE CLEAR LAKE													25 per day 10 per day Hook and line only No sale
Striped Bass		1-3-12A													None under 12 inches, 5 per day. None to be taken from Sallan Sea. See Note 19
Crabs		ALL EXCEPT 1½-6-7-8-9							30				15		Season Districts 1½-6-7-8-9 August 31, December 1-6 See Note 24, None under 7 inches. No Female
Abalones		ALL	14				16								Only for food. Must be brought to shore after in shell Angling License Required. See Note 27
Pismo Clams		17													None under 5 inches. No shipment. 15 per day Angling License Required. District 18a Closed
Spiny Lobster		ALL											15		No Sale of Meat. None under 10½ or over 16 inches See Note 24
GRUNION		ALL													

Salmon and Shad May Be Taken as Noted in Paragraphs 19-23. No open season on Sturgeon (possession prohibited).

NOTES

IT IS ALWAYS UNLAWFUL

- To hunt, kill, possess wild birds or mammals, to possess firearms, except under written permit from the Commission, within districts 1a, 1b, 1c, 1d, 1e, 1f, 1g, 1h, 1i, 1j, 1k, 1m, 1n, 1o, 1p, 1q, 1r, 1s, 1t, 2a, 2b, 3a, 3b, 3c, 3d, 3e, 3f, 3g, 3h, 4a, 4b, 4c, 4d, 4e, 4f, 4g, or General Grant Refuge, or the Mt. Tamalpais Game Refuge, including Richardson Bay, or San Francisco Refuge, or Silver Lake Refuge (water fowl may be killed in 4a and 4e), or to hunt quail in the Bolinas Quail Refuge, or to hunt or discharge firearms in Huntington Lake Refuge or San Leandro Bay Refuge.
- To hunt birds or mammals excepting predators without a hunting license.
- To possess any bird net or to net, trap or to hold protected game or birds of any kind, their nests or eggs except under written permit from the Commission.
- To take or possess more than 8 geese per day or 50 per week; or more than 8 honkers or sea brant per day or 24 per week.
- To take or kill non-game birds, except blue jay, butcher bird, English sparrow, sharp-shinned, Cooper or duck hawk, great horned owl, linnet, white pelican, shag, and in districts 1, 2, 3, 4 and 4½, blackbirds.

- To hunt deer without a deer tag license. To fail to attach to the horns of deer immediately on killing, properly filled out license tag or at the same time to send duplicate tag to the Division. To carry a deer into a closed district without having license tag countersigned, or to have untagged deer in possession. To fail to retain in possession during open season and for ten days after the skin and portion of head bearing horns of deer killed and to produce upon demand. To use more than one dog to the hunter in hunting deer or to allow dogs to run deer in closed season, or to possess doe or fawn skins, or deer skins not bearing evidence of sex.
- To trap for profit bear, ring-tailed cat, coon, pine marten, skunk, fisher, wolverine, mink, river otter, fox, beaver or muskrat, or to kill these animals during the closed season, except when destroying property. To interfere with the traps of licensed trappers. To use saw tooth or spike jawed traps for taking fur bearers.
- To use any animal other than a dog to stalk wild birds.
- To shoot game from a power boat, sailboat, auto, airplane; or to hunt waterfowl from a scull boat in districts 8, 9, except on Wednesdays and Sundays, or at any time in district 12 or Napa River south of Edgerly Island, or to use a

shotgun larger than ten gauge, or to possess an extension automatic or a cane gun.

10. To shoot resident game between 1 hour after sunset and 1 hour before sunrise, or migratory game between sunset and 1 hour before sunrise. To use a spotlight in hunting game.

11. To hunt waterfowl in districts 4, 4j, 4a, 4e, 19, 20, 20a, 22, other than on Wednesdays, Saturdays, Sundays, legal holidays, opening and closing days; or in district 4a except between 8 a.m. and sunset. To drive game birds by means of auto, airplane, or power boat over shooters.

12. To take game or fish longer than 5 days after close of season, venison 15 days.

13. To sell wild game, except cottontail and brush rabbits.

14. To make a false statement in applying for license. To fail to show license upon demand to any officer.

15. To take game or fish from one district to another when season is not open in both. (Special law for deer and trout.) Trout legally taken may be transported from an open district into a closed district by the consignor making an affidavit in duplicate setting forth his name, address, number of angling license and name and address of consignee. The original must be attached to the shipment, the copy left on file with the officer before whom sworn. Trout may be shipped into closed district when accompanied by written statement to the effect that tag were legally signed by the shipper, countersigned by agent to whom offered for shipment.

16. To ship wild birds, mammals, or fish except smoked or dried fish other than trout by parcel post, or in concealed packages or without a tag bearing name and address of consignee and consignor and contents, or to ship game out of state.

17. To operate a commercial hunting club without license.

18. To place obstructions in streams in districts 1, 1j, 2, 2j, 3, 4, 4j, 23, 24, and 26 that will stop or impede fish.

19. To buy, sell or ship striped bass less than 20 inches in length, or to ship striped bass out of state, or to ship striped bass during closed season; to take other than with hook and line. To possess more than five shad per day between May 18 and July 31, or September 17 and November 14.

20. To take trout other than with rod and line held in the hand or with lure with more than 2 attractor blades or more than 3 hooks.

21. To have in possession any fish spear or gaff (except landing gaff) within 300 feet of any lake or stream when unlawful to spear salmon.

22. To take trout in any lake within 300 feet of the mouth of any stream from October 31 to August 1, or in that portion of any stream flowing into any lake in districts 23 and 24 within two miles from its mouth, upstream, from October 31 to August 1.

23. To take salmon on spawning beds or within 10 miles of a spawning station or 3 miles north and south of mouth of Klamath River; to take in ocean and Humboldt Bay district Chinook less than 27, or Silver less than 24 inches, or to gaff or club undersized salmon, or to bring ashore in such condition that the size can not be taken, or to not have a landing

net in any salmon boat. To take more than 2 salmon per day in districts 1, 1j, 2, 2j, Klamath River (above tidewater), 3, 12a, Klamath River tide except between July 1-September 5; to spear salmon except in districts 1, 1j, 2, 2j, Klamath River above tidewater; to take salmon in any way except between dates given—district 1 May 29-October 31; 1j, Klamath River May 29-December 31; 2, 2j, May 1-February 1st; 3, 12a May 1-October 31; to take or possess salmon except between dates given—districts 6, 7, 8, 9, May 1-September 15; districts 10, 11, May 1-August 15; districts 15, 16, 17, 18, April 1-June 30; to spear salmon except between dates given—district 1 May 29-October 31; 1j, Klamath River above tide August 1-October 31; 2, 2j, November 1-February 1st.

24. To bring to shore crabs or lobsters in such condition that the size can not be taken; or to ship or carry crabs out of districts 1j, 2j, 5, 6, 7, 8, or 9.

25. To take or possess in district 3 salt water eels of less than 12 inches or more than 15 per day.

26. To take or possess cockles less than 1 1/2 inches in diameter, or to take or possess more than 15 (Dist. 10) Washington clams or more than 10 horse clams or more than 30 razor clams per day, or in districts 18, 19, 21 more than 15 pounds of mussels per day.

27. To take red abalones less than 7 inches in the greatest diameter: green, 6; pink, 8; black, 5; to dry abalones; to give for abalones in districts 7, 15, 16, 17, 19, 20 and 20a; to take more than 10 per day or 20 per week in districts 7, 15, 16, 17, 19, 20 and 20a. To take more than 10 per day from abalone in districts 7, 19 and 18; to take more than 10 black abalones per day in districts 14, 15, 17, 18, 19, 20, 20a, 21.

28. To fish for game fish without having an angling license.

29. To take game fish between 1 hour after sunset and 1 hour before sunrise in districts 1, 1j, 2, 2j, 24, 3, 4, 4j, 4j, 23, 24, 25.

30. To fish with nets except in commercial districts.

31. To fish through the ice for any fish or to take fish in district 14.

32. To place, cause to be placed, or discharge into any waters substances deleterious to fish or plant life.

33. To fish within 250 feet of a fishway or 150 feet of the upper side of a fish screen, or the lower side of a dam, or to take fish except salmon within 1 mile of the lower side of a spawning station, or any lake within 1 mile of a spawning station when station is in operation.

34. To kill, injure or capture California sea lions in districts 19, 20, 20a.

35. To take invertebrates or marine plants in Hopkins Marine Refuge (Monterey Co.) or in that area between the west line of the property of the Scripps Institute and a line 1,000 feet west of low tide line (San Diego Co.).

36. To take more than 5 white sea bass from May 1 to June 30, or to take at any time more than 5 under 25 inches.

37. To take more than 30 pounds of halibut under 4 pounds each, or to take more than 6 barracuda less than 3 pounds each.

LICENSES MUST BE SHOWN UPON DEMAND

Districts 1a, 1b, 1c, 1d, 1e, 1f, 1g, 1h, 1i, 1j, 1k, 1m, 1n, 1o, 1p, 1q, 1r, 1s, 1t, 1u, 1v, 1w, 1x, 1y, 1z, 2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h, 2i, 2j, 2k, 2l, 2m, 2n, 2o, 2p, 2q, 2r, 2s, 2t, 2u, 2v, 2w, 2x, 2y, 2z, 3, 4, 4a, 4b, 4c, 4d, 4e, 4f, 4g, 4h, 4i, 4j, 4k, 4l, 4m, 4n, 4o, 4p, 4q, 4r, 4s, 4t, 4u, 4v, 4w, 4x, 4y, 4z, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 20a, 21, 22, are Commercial Fishing Districts. Hunting and angling in accordance with law relating to main districts in which refuge is located. Districts 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 20a, 21, 22, are Commercial Fishing Districts. Hunting and angling in accordance with law relating to main districts in which small district is located. District 14 is a Fish Reservation. All fishing prohibited. District 8 1/2 includes those townships in Mendocino County bordering on the Pacific Ocean (except 15 and 16 W. 11 N.) and townships 13, 14, 15, 16, 17 and 18 N. R. 16 W. District 23. The water shed of Lake Tahoe and Truckee River, Rubicon and Little Rubicon above confluence water shed of American River and Silver Creek above confluence. District 24 includes waters in watershed of Cosumnes above mother lode highway bridge, waters of South Fork American River between Chili Bar Bridge and mouth of Silver Creek; the waters of the Carson, West Carson and all tributaries, Twin Lakes, Silver, Twin, Elko, Meadow, Wood, Winnemoose, Scott, Burnside Lake and all tributary streams.

LICENSE PROVISIONS

HUNTING

License year after July, 1931, July 1 to June 30

Residents under 18	\$1.00
Resident citizens	2.00
Non-resident citizens	10.00
Declarant Aliens	10.00
Other Aliens	25.00

On account of change in hunting license year, cost of license from January 1, 1932, to June 30, 1933 (18 months), will be 1 1/2 times above schedule.

ANGLING

License year January 1 to December 31

Resident citizens	\$2.00
Non-resident citizens	3.00
Under 18 no license required	5.00

TRAPPING

License year July 1 to June 30

Citizens	\$1.00
Aliens	2.00

Under 18 no license required

DEER TAG

License year January 1 to December 31

Everyone (2 tags)	\$1.00
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COMMERCIAL HUNTING CLUBS

License year July 1 to June 30

Citizens	\$25.00
Aliens	100.00
Operators, citizens	5.00
Operators, aliens	25.00

For Laws in Full See Penal Code.

For Commercial Fish Laws See Commercial Abstract.

For Information Regarding Fish or Game Write to the Division of Fish and Game



